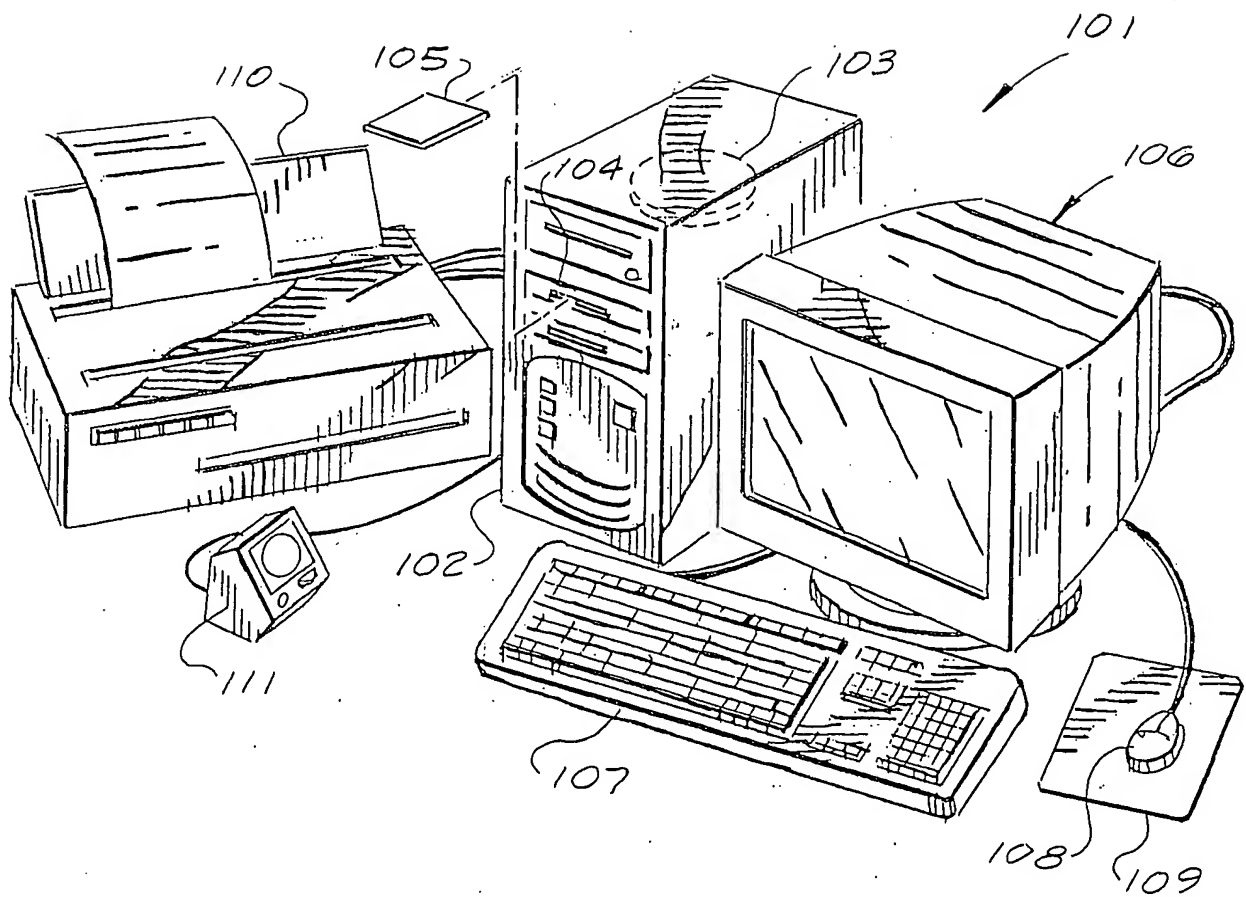


FIG. 1A



## FIG. 1B-1

General Listing and Description of Primary ADS Data Types

In - Input device n of the ADS  
 Xn - sensory "reading" of input device In (may be proprioceptive)  
 XRFn - a specified range/purview of In  
 RF - a rule that is "true" if Xn is included in XRFn  
 BF - a set of RF's identifying a "doing"  
 RFs - RF about the self ADS  
 RFsB - an RFs identifying a doing of the ADS  
 RFsM - an RFs identifying a "metabolic" status of the ADS  
 RFsE - an RFs identifying an "emotion" of "feeling" of the ADS  
 BFs - a set of RFs's identifying the doings or metabolism or feelings of the self ADS  
 RFM - a unique marker referring to an RF  
 BFM - a unique marker referring to a BF  
 PFM - an arbitrary unique marker to be used to refer to a PF  
 Rx - a "concrete" set of "sensed" RFM's referring to a sensed "concrete" object  
 Ri - an "abstract" set of RFM's  
 Px - a "concrete" set of allocated PFM's plus "concrete" RFM-set  
 Pi - a set of PFM's and RFM's referring to an "abstract object", often a single PFM  
 Ris - the "self" object  
 r - a specified spacio-temporal relationship, including the null relation  
 SE - a single-relation abstract situation, i.e., an r between among abstract objects, including a self object; thus  
 $SE = r(Ris, Pi1, Pi2, \dots)$   
 Si - a Boolean set of SE's defining an abstract situation  
 dsd - an "incremental" action decision for a self-object  
 Lx - a location of a (usually-concrete) object, i.e., an Rx/Px  
 Vx - a vector of a (usually-concrete) object, i.e., an Rx/Px  
 Ex - an "event", for example described as a data row:  
 $Rx/Px \dots Lx \dots Vx \dots BF$   
 Sx - a concrete situation described as a set of Ex's  
 PF - a "hierarchied" rule that if (from the viewpoint of the tested object) the tested concrete situation (Sx) is included in the abstract situation (Si) of the rule, then DO the incremental action decision of the rule (dsd), each set of hierarchied PF's associated with an object being adequate for incremental simulation  
 SxC - the "now" Sx of an ADS, including access to the PF's referred to by the PFM's of the Px's of the Ex's  
 SxTn - (SxT1=SxC) from n=2, the nth incremental computation (in simulation) of the predicted situation of an ADS  
 Sip - an abstract situation (Si) of the self ADS which identifies a (hierarchied) problem p

3/62

FIG. 1B-2

Sigp - an abstract situation (Si) of the self ADS which identifies a (hierarchied) subgoal g attached to the problem  
 P  
 dD - a hierarchied default real-time action decision attached to an abstract situation of the self ADS  
 dTd - a hierarchied trial (to try to get to a later subgoal without incurring a worse problem) incremental action decision attached to an abstract situation of the self ADS  
 dc - a "coordinated" real-time action decision for the ADS equal to (based on) a "successful" dTd (trial incremental decision)  
 G - a plan (a hierarchied set of subgoals g), each subgoal g having associated hierarchied dD's and dTd's  
 Gpn - the nth subgoal of a plan to solve the problem p  
 Pil - one of the "look-for" Pi's (abstract objects) of the next Sigp (of the next subgoal g), i.e., the next Gpn  
 RFl - one of the "look-for" RF's generated by finding (from a list of known concrete objects with their associated RF's) concrete objects including a current Pil and heuristically-selecting RF's to look for

FIG. 2

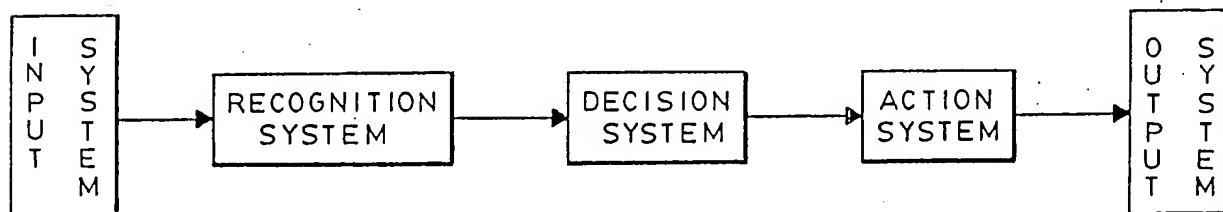


FIG. 3

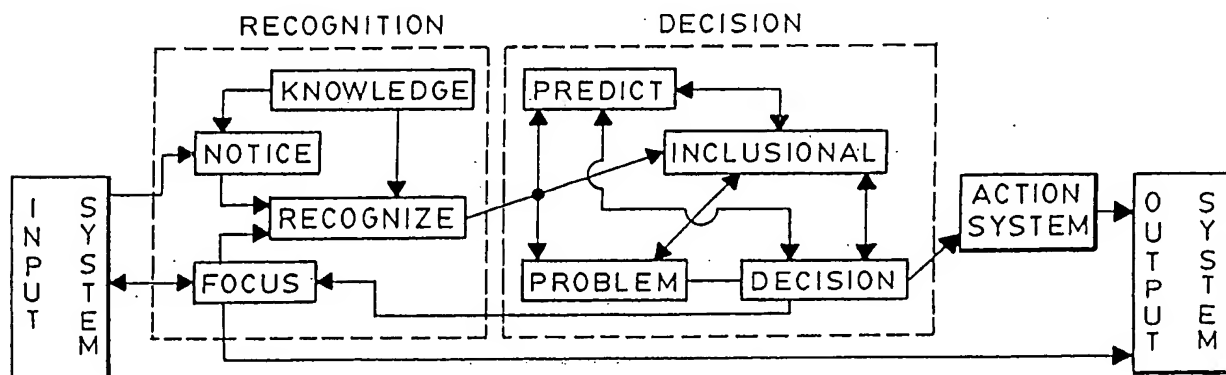


FIG. 4

4/62

DATA FLOW IN AUTONOMOUS DECISION SYSTEM

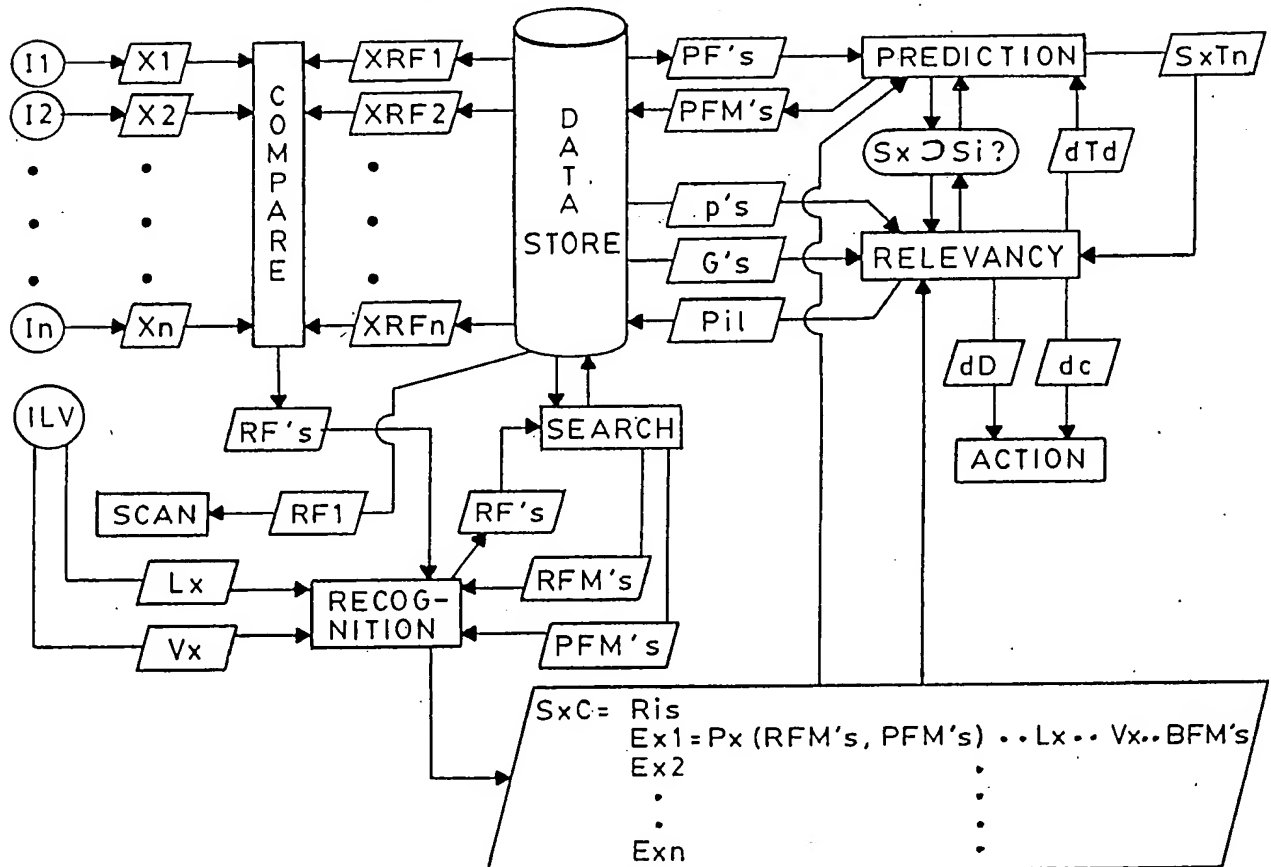
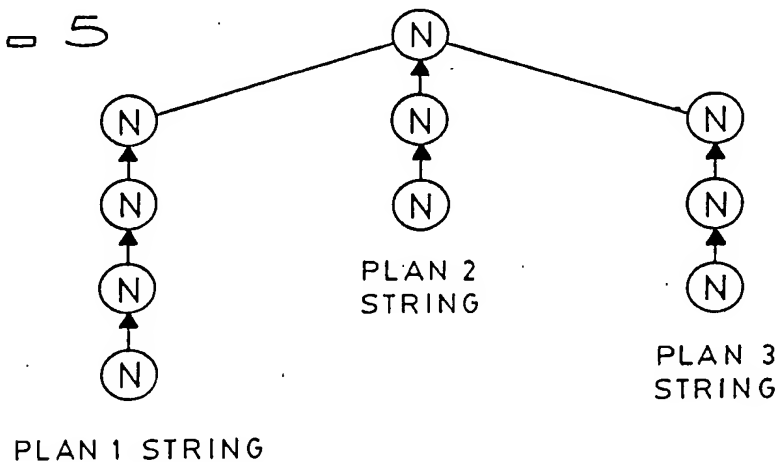


FIG. 5



- "N" MEANS A "NODE"
- UPPER-MOST NODE IS THE ABSENCE OF THE RELEVANT PROBLEM

## FIG. 6

EXAMPLE COMPUTATION FLOW FOR TESTING WHETHER A GIVEN  
CONCRETE SITUATION ( $S_x$ ) IS INCLUDED IN A GIVEN ABSTRACT  
SITUATION ( $S_i$ ), ONE SUB-EVALUATION ( $SE$ ) AT A TIME:

-----  
Definition Reminders:

$$S_x = \begin{pmatrix} (Px_1 = [PFM_1, PFM_2, \dots, PFM_n; RFM_1, RFM_2, \dots, RFM_n] \dots Lx_1 \dots Vx_1 \dots BFM's_1) \\ (Px_2 = [PFM_1, PFM_2, \dots, PFM_n; RFM_1, RFM_2, \dots, RFM_n] \dots Lx_2 \dots Vx_2 \dots BFM's_2) \\ \vdots \\ (Pxn = [PFM_1, PFM_2, \dots, PFM_n; RFM_1, RFM_2, \dots, RFM_n] \dots Lx_n \dots Vx_n \dots BFM's_n) \end{pmatrix}$$

$SE = r(Pi_1, Pi_2, \dots, Pin)$  where any abstract thing ( $Pi$ ) may  
specify one or more doings (BFM's) and  
where each  $Pi$  is a set of PFM's and a  
set of RFM's

-----  
Computation Flow:

IS $Px_1$ INCLUDED IN $Pi_1$ ? (i.e.,	IF YES, $Px_1$ MAY STAND FOR $Pi_1$
IS $Pi_1$ A SUBSET OF $Px_1$ ? BFM'S?	IN THE RELATION $r$ (PROVIDED
	THE BFM'S OF $Pi_1$ , IF ANY, ARE
	A SUBSET OF THE BFM'S OF $Px_1$ )
IS $Pi_2$ A SUBSET OF $Px_1$ ? BFM'S?	IF YES, $Px_1$ MAY STAND FOR $Pi_2$
IS $Pi_n$ A SUBSET OF $Px_1$ ? BFM'S?	IF YES, $Px_1$ MAY STAND FOR $Pi_n$
IS $Pi_1$ A SUBSET OF $Px_2$ ? BFM'S?	IF YES, $Px_2$ MAY STAND FOR $Pi_1$
IS $Pi_n$ A SUBSET OF $Px_2$ ? BFM'S?	IF YES, $Px_2$ MAY STAND FOR $Pi_n$
IS $Pi_1$ A SUBSET OF $Pxn$ ? BFM'S?	IF YES, $Pxn$ MAY STAND FOR $Pi_1$
IS $Pi_n$ A SUBSET OF $Pxn$ ? BFM'S?	IF YES, $Pxn$ MAY STAND FOR $Pi_n$

-----  
FOR ALL PERMUTATIONS OF  $Px$ 'S STANDING FOR  $Pi$ 'S,  
RESPECTIVELY, COMPUTE WHETHER THE  $r$  IS TRUE (FROM THE VIEWPOINT  
OF THE  $Lx/Vx$  OF THE APPROPRIATE "SELF" ROW OF THE  $S_x$ , I.E., THE  
APPROPRIATE  $Px$ ) CONSIDERING THE  $Vx$ 'S AND  $Lx$ 'S OF OTHER  $Px$ 'S  
STANDING FOR THE  $Pi$ 'S OF THE RELATION  $r$ .

FOR ALL "TRUE" SUCH RELATION COMPUTATIONS, THERE IS  $SE$   
INCLUSION. OTHERWISE, NOT. [FOR  $S_i$  INCLUSION DETERMINATION, THE  
BOOLEAN COMPUTATIONS AMONG THE  $SE$ 'S OF THE  $S_i$  MUST BE DONE.]

FIG. 7A-1

6/62

```

} Unit Si_mod; {
  Purpose: Owner: TFL
  This is the main brain code. It determines the inclusionals for all
  decision making.
  History:
  2/25/91: Rick added support for Story telling data using lecture mode
           and added Dans extra parm in the relations call.
  04/10/91 - Changed method of testing for body relations. Now any Row
             can do a test for HHT's by specifying itself as the 1st
             ri, ri2=to rfs that refer to HHT regs, and relop=FEEL.
  05/13/91: Added code to continue scanning SE's, even if current SE
             fails when the NextOp is BOR.
  07/29/91: Added code to allow to handle "sortof" of invalid SE's.
             If your SE spec's an RI that cant be found, then it was
             assumed FALSE. Now, if the preceeding NextOp is BNOT, then
             that boolean will be applied, and the SE will become TRUE.

  Copyright (c) 1989-1991 Anthrobotics

```

Upcoming changes to SIMOD, because of TFL.

- Onehit will be replaced with Nhits. This allows for dsd averaging. (this can be up to 20, the size of the datalist buffer.)
- Relative row/relrownum need to be expanded in SxRow to n hits.

```

{
  } Interface {
  Uses NewTypes, Types, Lists, Relation, SiStuff, DatList, Sxstuff;
  Const MaxSiHits : Integer = 1; {Tells how many SiStatuss to allow}
  -----
  PROCEDURE Situation_Inclusion(Var SiListToTest : DataList; {What Sis to test;
  set by Rxs}
                               Var SisThatHit : DataList; {Returns list of Sis
  that hit}
                               Var TheSx : ListPtr;
                               Var SxIndex : SxIndexArray;
                               DefaultRow : SxRowPtr);
  -----
  } Implementation {
  Uses RxStuff1, RiStuff, Strategy;
  Const BreakSi : Word = 0; {used for debugging only!}
  -----
  Situation Methods
  PROCEDURE Situation_Inclusion(Var SiListToTest : DataList; {What Sis to test;
  set by Rxs}
                               Var SisThatHit : DataList; {Returns list of Sis
  that hit}
                               Var TheSx : ListPtr;
                               Var SxIndex : SxIndexArray;
                               DefaultRow : SxRowPtr);

  Purpose: Owner: TFL
  This is it. The main cheese, where men are men and sheep are scared.
  This is where all the brain inclusionals occur.
  Be in awe, mortal.
}

```

```

Var SxRowPtr1,
    SxRowPtr2 : SxRowPtr;
    CurrentRI : Array[0..1] of RiPtr;
    ValidRow : Boolean;
    ANotSE,
    SIFailed, (Goes TRUE once we know weve failed.)
    SEPastedDefault,
    SEPasted, (The boolean status of the SE's so far.)
    SiStatus : Boolean;
    CurrentSi : SiPtr;
    SiNumber : Byte;
    SENUM : Integer;
    SxRowCount1,
    SxRowCount2 : Byte;
    PrevHitRxs : Array [0..1, 1..MaxSesPerSI] of SxRowPtr;
    PrevHitRows : Array[ 0..1, 1..MaxSesPerSi] of Integer;

```

FIG. 7A-2

7/62

```

{-----}
PROCEDURE Check_And_Set_PrevUsed_Ris (Var TheRow: SxRowPtr;
                                      RiNum,
                                      RiCol,
                                      SxRowNum : Integer);

Var Col, Row : Integer;
Begin
  PrevHitRows[RiCol, SEnum] := SxRowNum;
  PrevHitRxs[RiCol, SEnum] := TheRow;
  For Row := 1 to SEnum do
    For Col := 0 to 1 do
      If CurrentSI^.SiRec.Ses[Row].TheRis[Col] = RiNum then
        Begin
          TheRow := PrevHitRxs[Col, Row];
          PrevHitRows[RiCol, SEnum] := PrevHitRows[Col, Row];
          PrevHitRxs[RiCol, SEnum] := TheRow;
          exit;
        end;
      end; {check and set prevused ris}
    end;
  end;
{-----}
FUNCTION SxRow_In_SubEval (RiNum, RiCol: Integer; Var TheSxRow: SxRowPtr; Var
Row: Byte): Boolean;
Begin
  SxRow_In_SubEval := True;
  TheSxRow := DefaultRow;
  If RiNum <> SelfRi then
    Begin
      TheSxRow := SxRowPtr(TheSx^.Find_Element(SxIndex[Row].IndexPos));
      If RiNum <> AnyRi then
        SxRow_In_SubEval := TheSxRow^.Matches_Ri(CurrentRi[RiCol])
      end;
    end;
  else If (Row > 1) and (RiNum = SelfRi) then
    SxRow_In_SubEval := False;
  end; {SxRow in subeval}
{-----}
FUNCTION Find_Ri (RiNum, RiCol, SkipRow: Integer; Var SxRow: SxRowPtr; Var Row:
Byte): Boolean;
Var Hit : Boolean;
Begin
  Hit := False;
  If RiNum <> AnyRi then
    While (Not Hit) and (Row < TheSx^.Count) do
      Begin
        Inc(Row);
        If Row <> SkipRow then
          Begin
            Hit := SxRow_in_SubEval(RiNum, RiCol, SxRow, Row);
            If Hit then
              Check_And_Set_PrevUsed_Ris(SxRow, RiNum, RiCol, Row)
            else SxRow := Nil;
          end;
        end;
      end;
    end;
  else
    Begin
      Hit := True;
      Row := TheSx^.Count;
      SxRow := SxRowPtr(TheSx^.Find_Element(Row));
    end;
  end;
  Find_Ri := Hit;
end; {find ri}
{-----}
PROCEDURE Combine_Boolean;
Begin
  With CurrentSI^.SISec do
    Begin
      If SEnum > 1 then with Ses[SEnum-1] do
        Case NextOp of
          BNot,
          BAnd : SIStatus := SIStatus and SEPassed;
          BXor : SIStatus := SIStatus Xor SEPassed;
        end;
      end;
    end;
  end;
end;

```

8/62

```

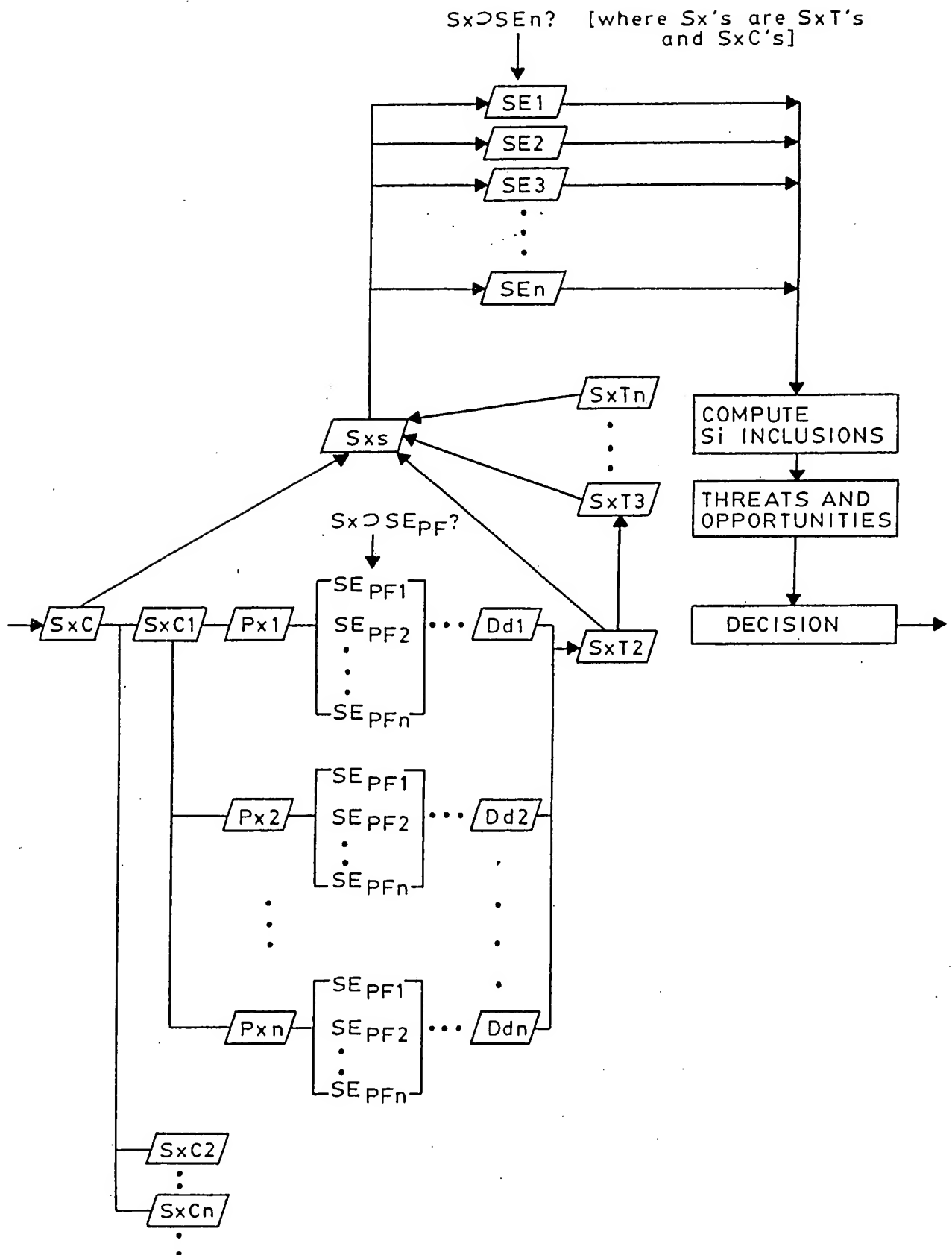
        BOR : SStatus := SStatus or SEPasted;
    end
    else SStatus:=SEPasted;
    If (SEPasted) then DefaultRow^.Set_Rel_Row(SxRowPtr2);
    SIFailed:=(SStatus=False) and (Ses[SENum].NextOp=BAAnd); {lookahead
boolean shortcut}
    end;
    end; {Combine boolean}
    {-----}
Begin
    For SiNumber:=1 to SiListToTest.Drec.Used do
        If (SiListToTest.Drec.Data[SiNumber]<>0) then {loop for each SI until you
have a hit...}
            Begin
                If SiListToTest.Drec.Data[SiNumber]=BreakSI then {DEBUG}
                    SENum:=0;
                    CurrentSI :=
SiPtr(SiList.Find_Element(SiListToTest.Drec.Data[SiNumber])); {Get current SI}
                    SStatus := True; {Until proven guilty...}
                    SIFailed := False;
                    SENum := 0;
                    FillChar( PrevHitRxs, SizeOf(PrevHitRxs), 0 ); {Clear PrevHitRxs}
                    FillChar( PrevHitRows, SizeOf(PrevHitRows), 0 );
                    With CurrentSI^.SIFac do
                        Repeat {Until no more subevals, or SI fails.}
                            Inc(SENum);
                            SxRowCount1:=0;
                            ANotSE:=(SENum>1) and {This handles special case
where se is true if} (Ses[SENum-1].NextOp=BNot); {no 2 RIs hit, but nextop =
NOT; (SE true)}
                            SEPastedDefault:=ANotSE;
                            SEPasted:=False;
                            CurrentRi[0]:=RiPtr(RiList.Find_Element(Ses[SENum].TheRis[0]));
                            With Ses[SENum] do
                                Repeat {find ri0 loop}
                                    If Find_RI(TheRis[0],0,0,SxRowPtr1,SxRowCount1) then
                                        Begin
                                            SxRowCount2:=0; {search from top of sxlist}
                                            Repeat {find ri1 loop}
                                                CurrentRi[1]=RiPtr(RiList.Find_Element(TheRis[1]));
                                                If Op=IsFeeling then
                                                    Begin
                                                        SxRowCount2:=TheSx^.Count;
                                                        SxRowPtr2:=SxRowPtr1;
                                                        SEPasted:=(SxRowPtr1^.Matches_Ri(CurrentRi[1]));
                                                        If ANotSE then
                                                            SEPasted:= (Not SEPasted);
                                                        SEPastedDefault:=SEPasted;
                                                    end
                                                else
                                                    If
Find_RI(TheRis[1],1,SxRowCount1,SxRowPtr2,SxRowCount2) then
                                                        Begin
                                                            SEPasted:=(Relations[Op](SxRowPtr1^,SxRowPtr2^,
DefaultRow^,OpParm));
                                                            If ANotSE then SEPasted:=Not SEPasted;
                                                            SEPastedDefault:=SEPasted;
                                                        end
                                                    else If SxRowCount2>=TheSx^.Count then
                                                            SEPasted:=SEPastedDefault;
                                                            Until (SEPasted) or (SxRowCount2>=TheSx^.Count);
                                                        end
                                                    else SEPasted:=SEPastedDefault;
                                                    Until (SxRowCount1>=TheSx^.Count) or (SEPasted);
                                                    Combine_Boolean;
                                                    Until (SIFailed) or {means this SI has definately failed.}
(Ses[SENum].NextOp=NoOp); {we hit last SE in the Si}
                                                    If (SStatus) and
(SisThatHit.AppendItem(1,SiNumber)) then
                                                        exit;
                                                    end;
                                                end; {Situation inclusional}{si mod unit}
                                end;
                            end;
                        end;
                    end;
                end;
            end;
        end;
    end;

```



FIG. 8

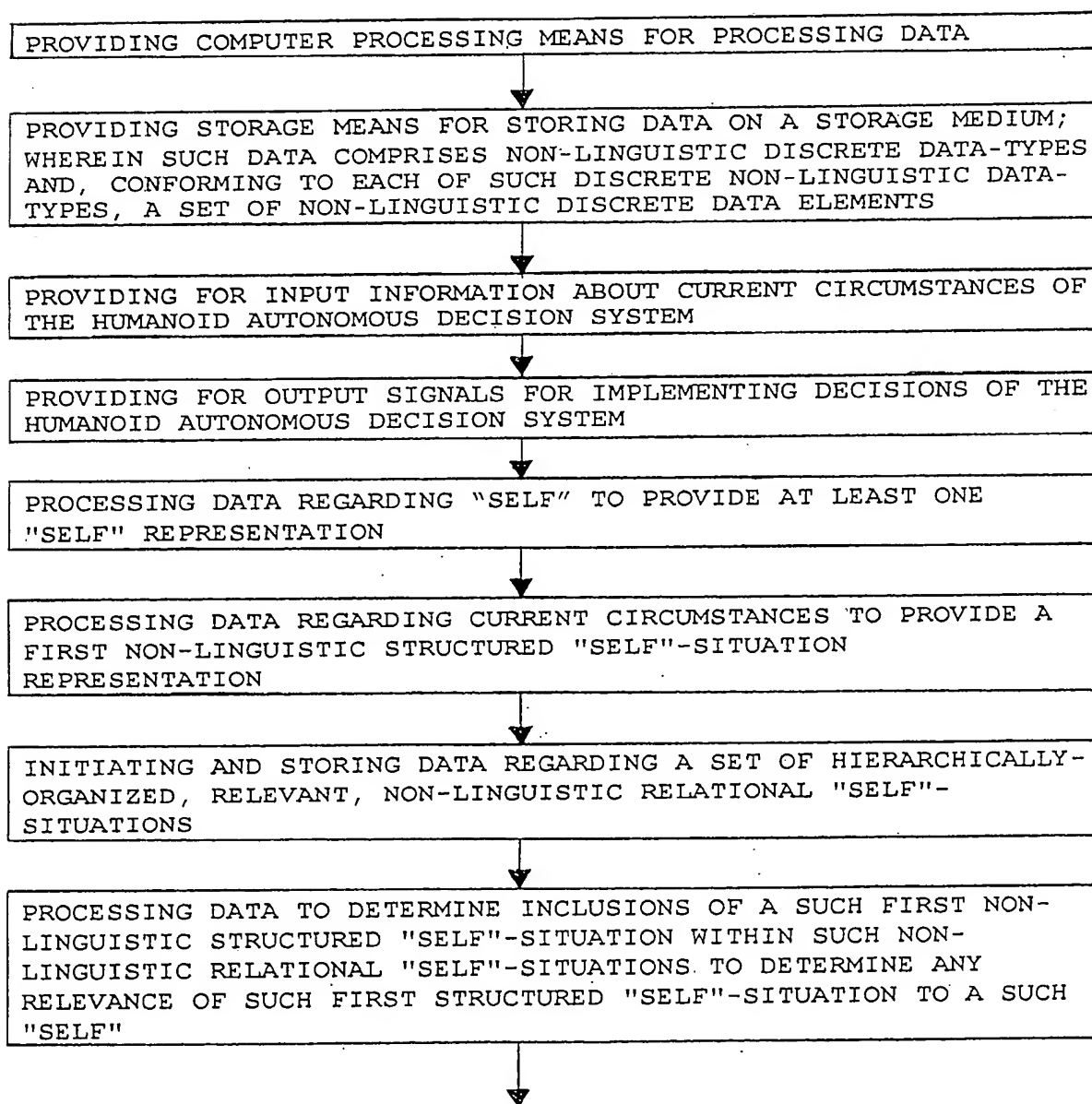
9/62



10/62

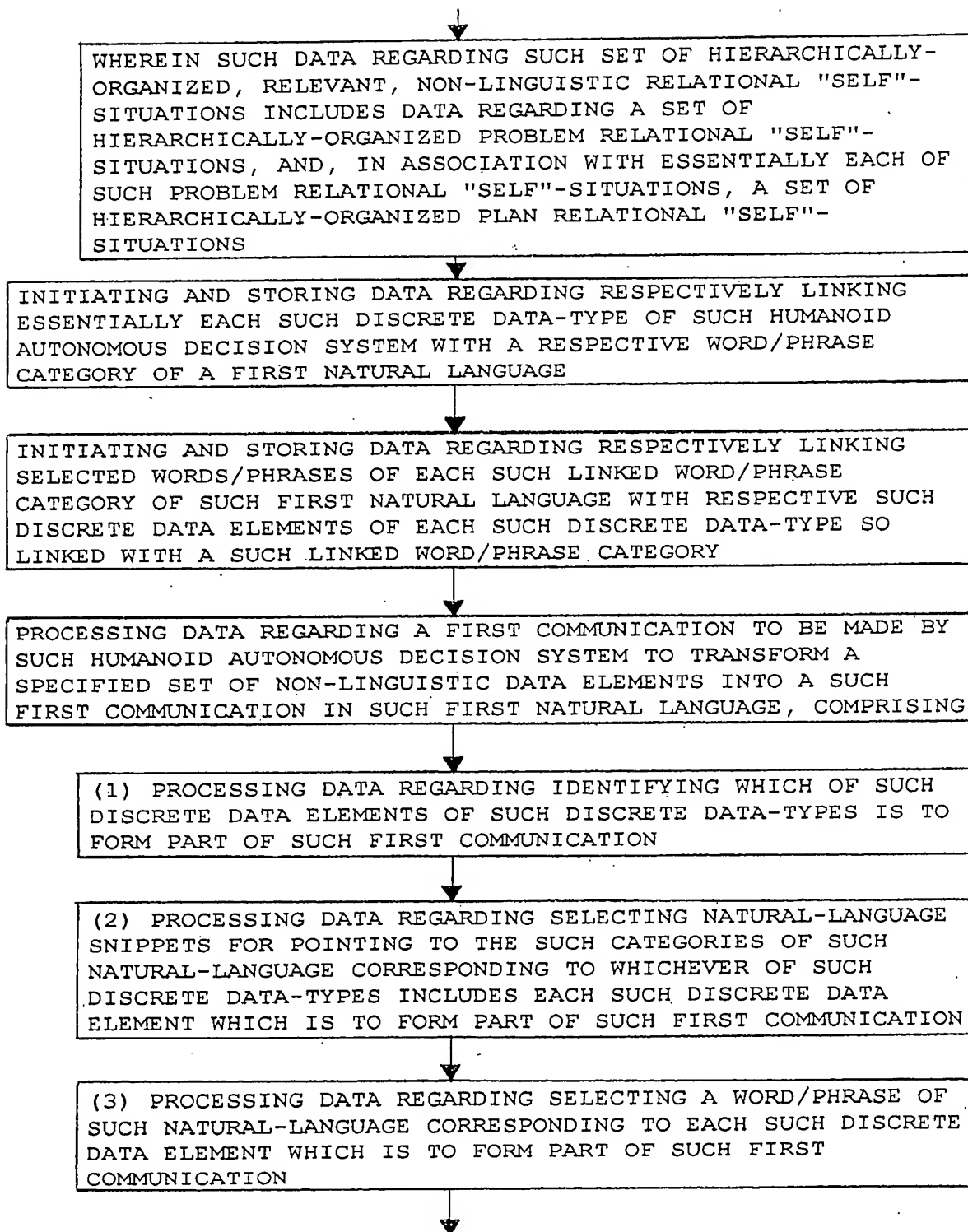
## FIG. 9A-1

### STEPS IN A COMPUTER PROGRAM IMPLEMENTING NATURAL LANGUAGE AND STORY PRODUCTION IN AUTONOMOUS DECISION SYSTEMS



11/62

FIG. 9A-2



12/62

FIG. 9A-3

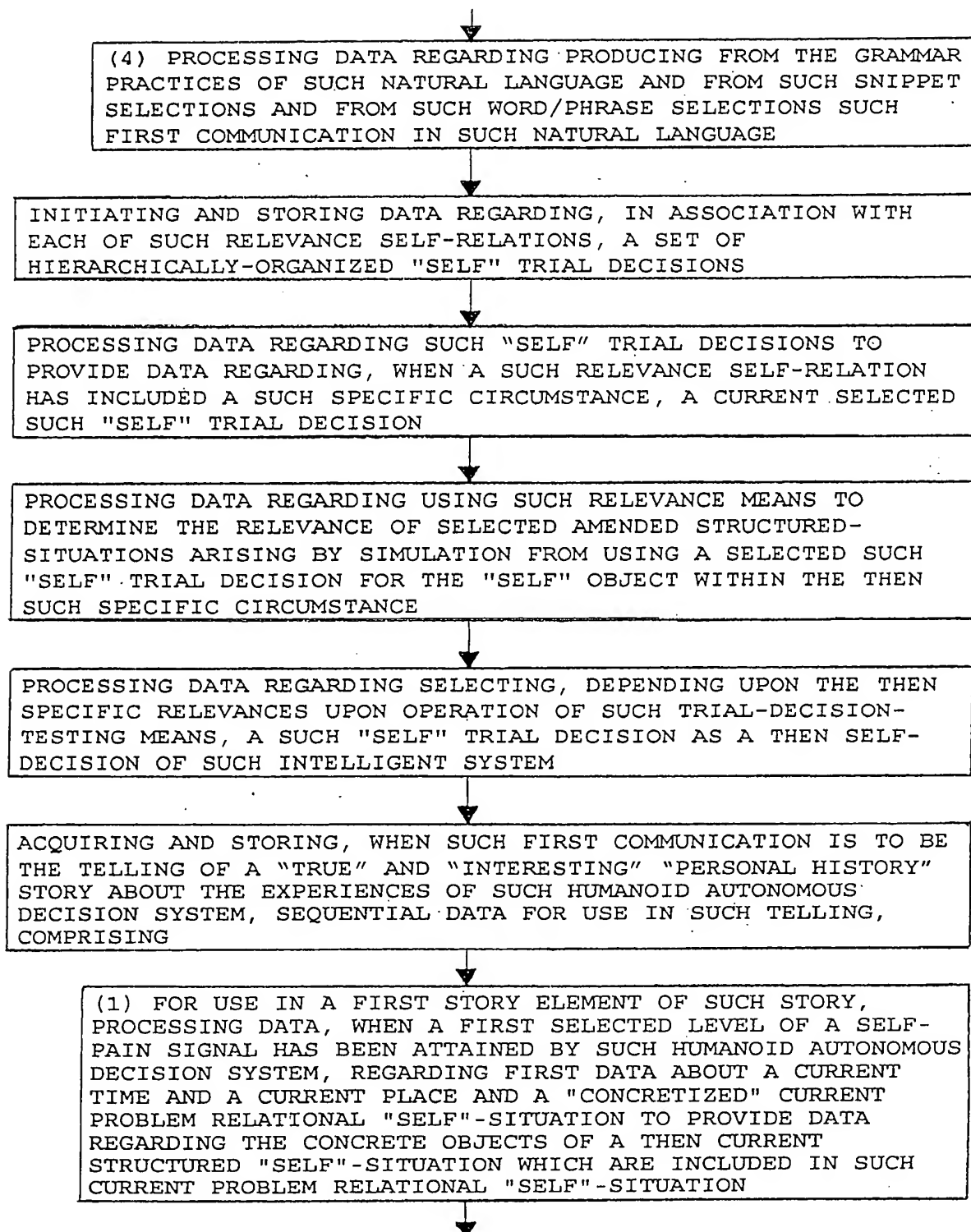


FIG. 9A-4

13/62

(2) FOR USE IN A SECOND STORY ELEMENT OF A SUCH STORY, PROCESSING DATA, WHEN A SUCH THEN CURRENT STRUCTURED "SELF"-SITUATION IS INCLUDED IN A FIRST PLAN RELATIONAL "SELF"-SITUATION, REGARDING SECOND DATA ABOUT A CURRENT STRATEGY AND A "CONCRETIZED" CURRENT SUCH PLAN RELATIONAL "SELF"-SITUATION, TO PROVIDE DATA REGARDING THE CONCRETE OBJECTS OF A SUCH THEN CURRENT STRUCTURED "SELF"-SITUATION WHICH ARE INCLUDED IN SUCH FIRST PLAN RELATIONAL "SELF"-SITUATION

(3) FOR USE IN A THIRD STORY ELEMENT OF A SUCH STORY, PROCESSING DATA, WHEN A SUCH THEN CURRENT STRUCTURED "SELF"-SITUATION IS INCLUDED IN A SECOND PLAN RELATIONAL "SELF"-SITUATION, REGARDING THIRD DATA ABOUT A CURRENT STRATEGY AND A "CONCRETIZED" SUCH SECOND PLAN RELATIONAL "SELF"-SITUATION, TO PROVIDE DATA REGARDING THE CONCRETE OBJECTS OF A SUCH THEN CURRENT STRUCTURED "SELF"-SITUATION WHICH ARE INCLUDED IN SUCH SECOND PLAN RELATIONAL "SELF"-SITUATION

(4) FOR USE IN A SEQUENTIAL STORY ELEMENT OF A SUCH STORY, PROCESSING DATA, WHEN A SUCH SEQUENTIAL CURRENT STRUCTURED "SELF"-SITUATION IS INCLUDED IN A NEXT IDENTIFIED PLAN RELATIONAL "SELF"-SITUATION, REGARDING SEQUENTIAL DATA ABOUT A THEN CURRENT STRATEGY AND A "CONCRETIZED" SUCH NEXT IDENTIFIED PLAN RELATIONAL "SELF"-SITUATION, TO PROVIDE DATA REGARDING THE CONCRETE OBJECTS OF A SUCH SEQUENTIAL CURRENT STRUCTURED "SELF"-SITUATION WHICH ARE INCLUDED IN SUCH NEXT IDENTIFIED PLAN RELATIONAL "SELF"-SITUATION

(5) FOR USE IN A FINAL STORY ELEMENT OF A SUCH STORY, PROCESSING DATA, WHEN A SECOND SELECTED LEVEL OF A SELF-PLEASURE SIGNAL HAS BEEN ATTAINED BY SUCH HUMANOID AUTONOMOUS DECISION SYSTEM, REGARDING FINAL DATA ABOUT A "CONCRETIZED" SUCH IDENTIFIED GOAL PLAN RELATIONAL "SELF"-SITUATION, TO PROVIDE DATA REGARDING THE CONCRETE OBJECTS OF A SUCH FINAL CURRENT STRUCTURED "SELF"-SITUATION WHICH ARE INCLUDED IN SUCH IDENTIFIED GOAL PLAN RELATIONAL "SELF"-SITUATION

PROCESSING DATA REGARDING SEARCHING OF ANY SUCH STORED SEQUENTIAL DATA TO PROVIDE USER-CONTROLLED SELECTION AMONG SUCH STORED SEQUENTIAL DATA

PROCESSING DATA REGARDING A USER-SELECTED LATER USE OF SUCH SEQUENTIAL DATA TO PROVIDE A LATER TELLING OF A STORY BASED UPON SUCH STORED SEQUENTIAL DATA

## FIG. 9B-1

STEPS IN A COMPUTER PROGRAM FOR IMPLEMENTING  
FIRST NATURAL LANGUAGE INTERPRETATION FUNCTIONS IN  
A HUMANOID AUTONOMOUS DECISION SYSTEM INTERPRETING  
INCOMING FIRST NATURAL LANGUAGE FROM AN OTHER

STORING IN A COMPUTER INFORMATION-STORAGE DEVICE DATA  
COMPRISING NON-LINGUISTIC DISCRETE DATA-TYPES AND, CONFORMING  
TO EACH OF SUCH DISCRETE NON-LINGUISTIC DATA-TYPES, A SET OF  
NON-LINGUISTIC DISCRETE DATA ELEMENTS

INITIATING AND STORING DATA REGARDING RESPECTIVELY LINKING  
ESSENTIALLY EACH SUCH DISCRETE DATA-TYPE OF SUCH HUMANOID  
AUTONOMOUS DECISION SYSTEM WITH A RESPECTIVE WORD/PHRASE  
CATEGORY OF SUCH FIRST NATURAL LANGUAGE

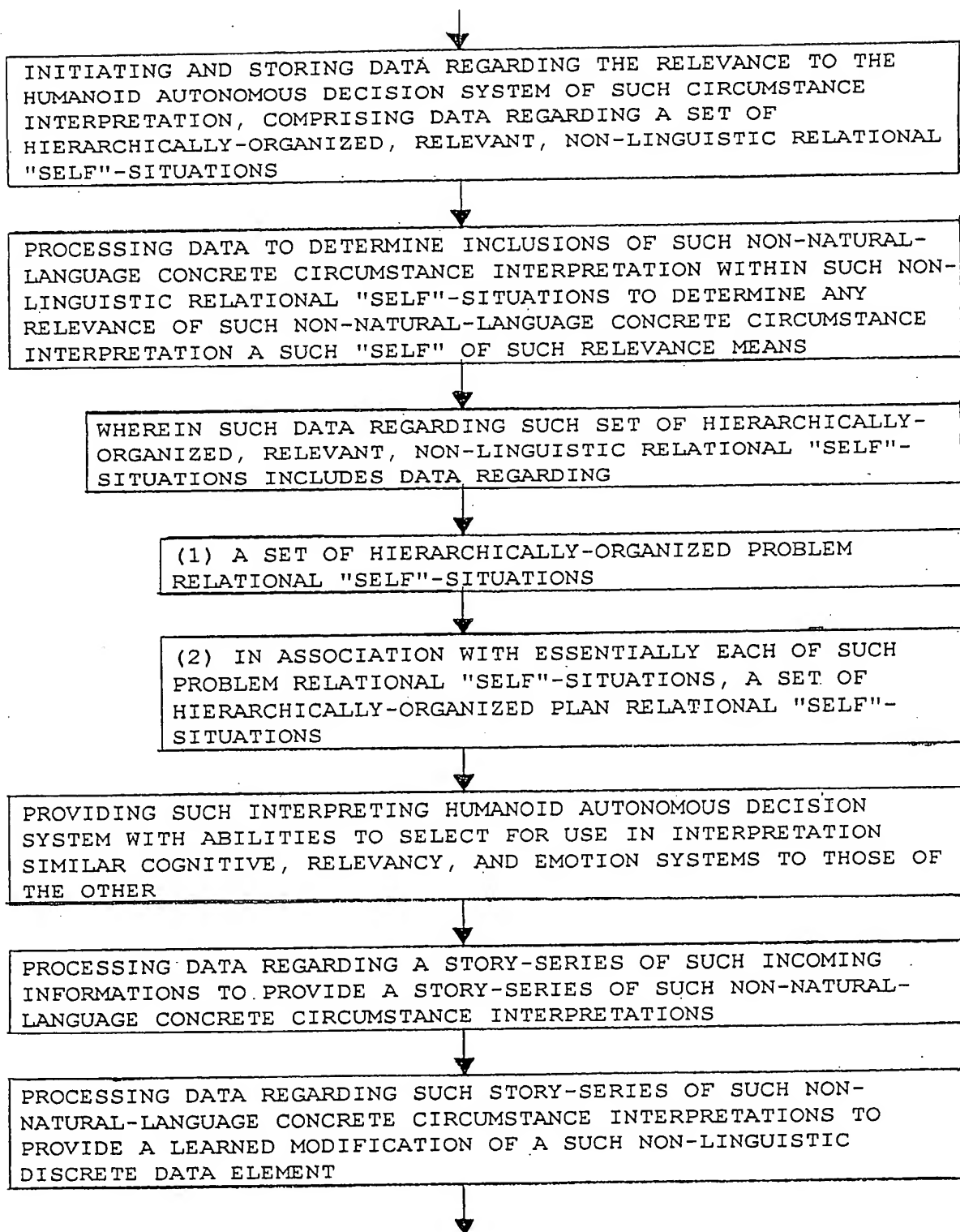
INITIATING AND STORING DATA REGARDING RESPECTIVELY LINKING  
SELECTED WORDS/PHRASES OF EACH SUCH LINKED WORD/PHRASE  
CATEGORY OF SUCH FIRST NATURAL LANGUAGE WITH RESPECTIVE SUCH  
DISCRETE DATA ELEMENTS OF EACH SUCH DISCRETE DATA-TYPE SO  
LINKED WITH A SUCH LINKED WORD/PHRASE CATEGORY

PROVIDING INPUT INFORMATION ABOUT CHARACTERISTICS OF SUCH  
INCOMING NATURAL LANGUAGE SUFFICIENT TO IDENTIFY EACH  
VOCABULARY ELEMENT, SNIPPET TYPE FOR EACH SUCH ELEMENT, AND  
GRAMMATICAL FUNCTION FOR EACH SUCH ELEMENT

PROCESSING DATA REGARDING SUCH INPUT INFORMATION TO PROVIDE A  
NON-NATURAL-LANGUAGE CONCRETE CIRCUMSTANCE INTERPRETATION OF  
SUCH INPUT INFORMATION

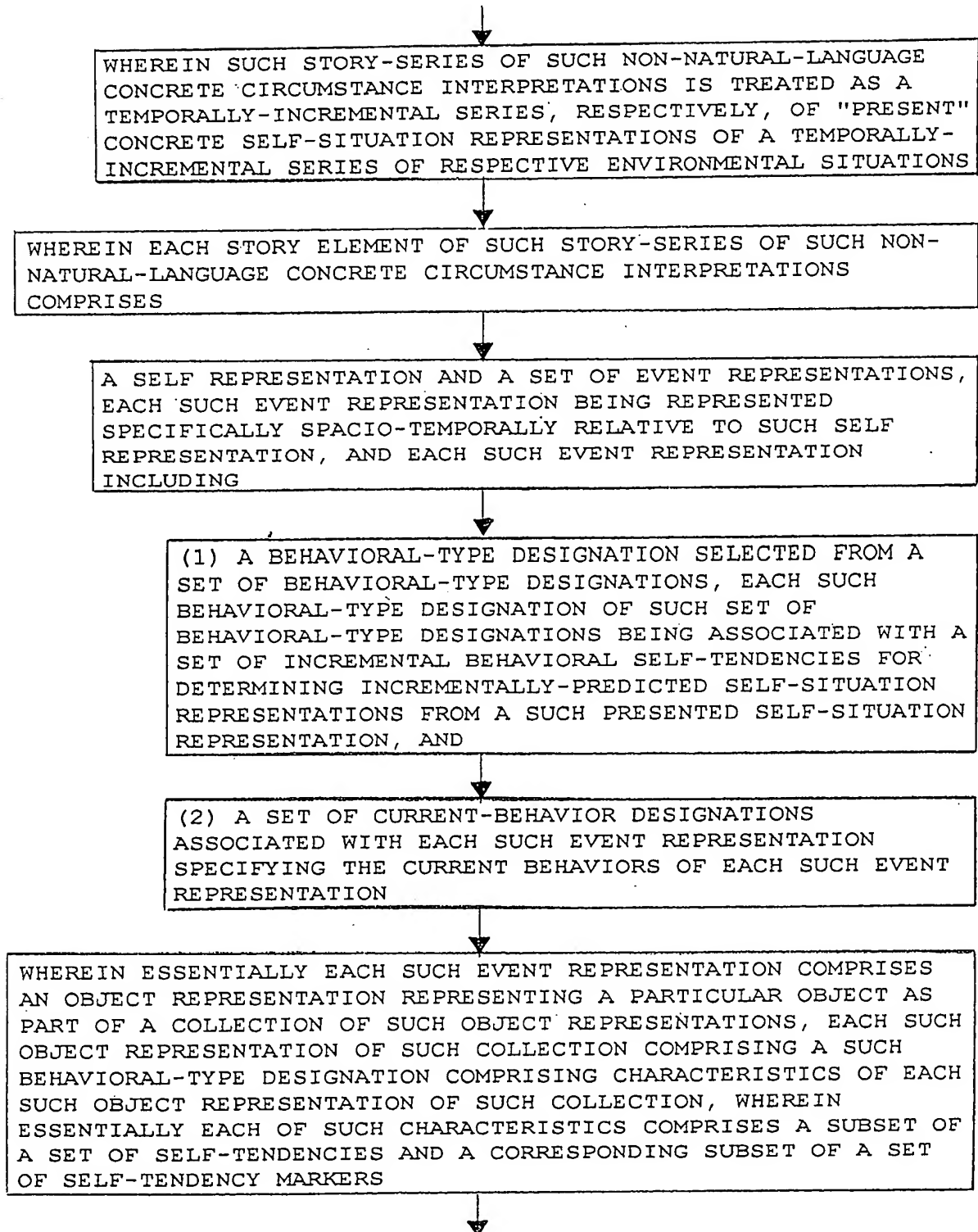
WHEREIN SUCH TRANSLATION MEANS COMPRISES NATURAL-LANGUAGE  
DEFAULT-SELECTING MEANS FOR PROCESSING DATA REGARDING  
SELECTION OF NON-NATURAL-LANGUAGE DATA TYPES AND DATA FOR  
CORRESPONDENCE WITH SUCH INCOMING INFORMATION

FIG- 9B-2



16/62

FIG. 9B-3





17/62

FIG. 9B-4

↓

SUCH SET OF SELF-TENDENCY MARKERS HAVING A 1-TO-1 CORRESPONDENCE WITH SUCH SET OF SELF-TENDENCIES, ONE UNIQUE MARKER FROM SUCH SET OF SELF-TENDENCY MARKERS CORRESPONDING RESPECTIVELY WITH EACH SELF-TENDENCY OF SUCH SET OF SELF-TENDENCIES

↓

SUCH SUBSET OF SELF-TENDENCIES BEING CONSTRUCTED AND ARRANGED TO PERMIT A DETERMINATION OF THE EXPECTED BEHAVIOR OF EACH SUCH OBJECT REPRESENTATION WITH RESPECT TO ANY MAPPABLE REPRESENTATION OF OTHER OBJECT REPRESENTATIONS FROM SUCH COLLECTION OF OBJECT REPRESENTATIONS

↓

EACH SUCH SELF-TENDENCY CONSISTING ESSENTIALLY OF AN INSTRUCTION FOR SELF-BEHAVIOR (OF ANY FIRST OBJECT REPRESENTATION TO WHICH SUCH SELF-TENDENCY MAY BE ASSIGNED) ON THE CONDITION THAT ANY MAPPABLE REPRESENTATION OF OBJECT REPRESENTATIONS FROM SUCH COLLECTION, INCLUDING SUCH FIRST OBJECT REPRESENTATION, FROM THE VIEWPOINT OF SUCH FIRST OBJECT REPRESENTATION, IS INCLUDED IN A SPECIFIED SELF-RELATION SELECTED FROM A SET OF SELF-RELATIONS

↓

WHERE EACH SELF-RELATION OF SUCH SET OF SELF-RELATIONS COMPRISES A SPECIFIED SPACE-TIME RELATION AMONG A SUCH FIRST OBJECT REPRESENTATION AND AT LEAST ONE SUCH OTHER OBJECT REPRESENTATION

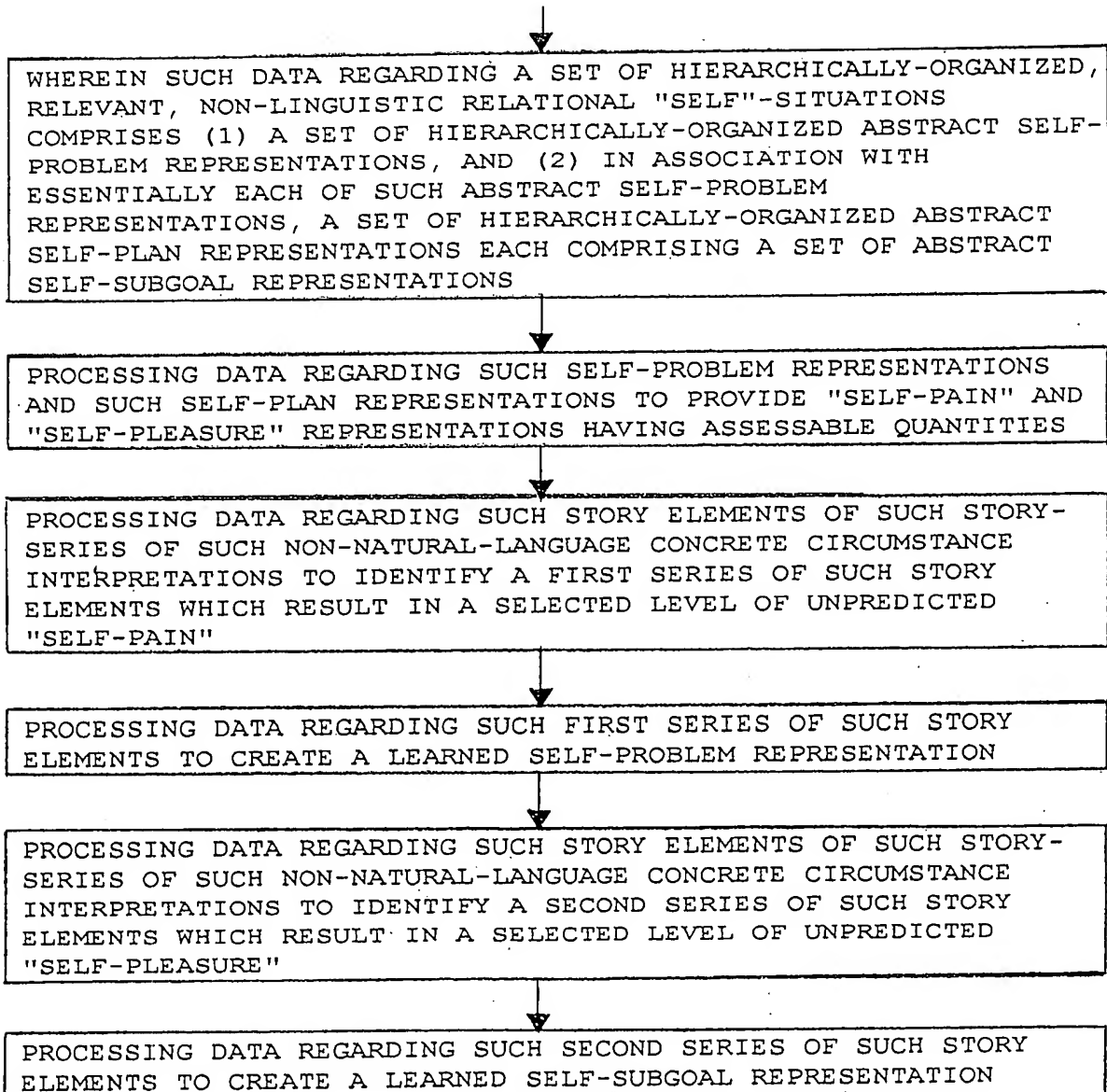
↓

EACH SUCH OTHER OBJECT REPRESENTATION BEING SPECIFIED AS A SUBSET OF A SET OF SELF-TENDENCY MARKERS, EACH SUCH SUBSET OF SELF-TENDENCY MARKERS CORRESPONDING TO THE SUBSET OF SELF-TENDENCIES ASSIGNED TO EACH SUCH OTHER OBJECT REPRESENTATION.

↓

18/62

## FIG-9B-5



```

    ) Unit Sagetalk; (
{
  Purpose: ===== Owner: TFL
  This unit contains the code that generates story text, based on the
  arousal record in the story2 unit. All kinds of substitutions occur.
  History:
  3/26/91 : Added Marty's sagetalk changes. RG
  7/24/91 : Mods made to reflect use of new synonym calls and to reflect
            spec changes per file SPTELNW3.1SP. - DS
  7/31/91 : Mods made to reflect new face emotional settings per Jay's
            spec, SAGEFACE.JAY. - DS
  Copyright (c) 1989-1991 Anthropotics =====
  {
    Interface {
  Uses Crt, Story2, Types, Playback;
  FUNCTION Describe_Story(Caps: Boolean): Integer;
  PROCEDURE Intro_Phrase(Which: Integer);
  PROCEDURE Then_Phrase(Which: Integer; Prefix, Suffix: Boolean);
  PROCEDURE Problem_Phrase(Which: Integer);
  PROCEDURE Strategy_Phrase(Which: Integer);
  PROCEDURE Decision_Phrase(Which: Integer);
  PROCEDURE NewDecision_Phrase(Which: Integer);
  PROCEDURE Plan_Phrase(Which: Integer);
  PROCEDURE NextNode_Phrase(Which: Integer);
  PROCEDURE Node_Phrase(Which: Integer);
  PROCEDURE Friend_Phrase(Which: Integer);
  PROCEDURE Last_Phrase(Which: Integer);
  PROCEDURE Describe_Arousals(Which: Integer);
  PROCEDURE Get_Highest_Regs;
    } Implementation {
  Uses General, NewTypes, Register, Face2,
    Terms4, Terms5, Terms6,
    DatList, Terms1, Terms2, Terms3, GoalStuff;

  Const UseCaps: Boolean = False; {if true, then sound_and_Text upcases 1st char}
        Spoke : Boolean = False;

  Type Volume = (VSame, VLOUD, VNorm, VSoft);
        Pitch = (PSame, PHiHi, PHi, PNorm, PLo, PLoLo);
        Faces = (FNorm, fSad, fGrim, fCTime);
  {-----}
  PROCEDURE Output_Face_Command(Command: Keywords; Parm1, Parm2, Parm3, Parm4:
ShortInt);
  Begin
    StoryFile.fCurrentCommand.Bytes[1]:=Parm1;
    StoryFile.fCurrentCommand.Bytes[2]:=Parm2;
    StoryFile.fCurrentCommand.Bytes[3]:=Parm3;
    StoryFile.fCurrentCommand.Bytes[4]:=Parm4;
    OutPut(' ', Command);
  end; {output face change}
  {-----}
  PROCEDURE Sound_And_Text(TheVolume: Volume; ThePitch: Pitch; S: Str150);
  Const VolumeLevels : Array[Volume] of Byte = (0, 6, 5, 4);
        PitchLevels : Array[Pitch] of Byte = (0, 8, 7, 6, 5, 4);
  Begin
    If UseCaps then S[1]:=UpCase(S[1]);
    Spoke:=True;
    UseCaps:=False;
    Save_Sound(0, VolumeLevels[TheVolume], PitchLevels[ThePitch], 10);
    OutPut(S, Say);
  end; {sound and text}
  {-----}
  PROCEDURE Show_Blink;
  Const Command : Array[1..6] of Keywords = (LEye, Reye, Display, Wait, Leye, Reye);
        Parm : Array[1..6] of ShortInt = (100, 100, 0, 125, -100, -100);
  Var I : integer;
  Begin
    For I:=1 to 6 do
      Output_Face_Command(Command[I], Parm[I], 0, 0, 0);
  end; {blink}
  {-----}
}

```

```

PROCEDURE Drive_Face(Var Comms,Prms; Count : Byte);
Var Commands : Array[1..1] of Keywords absolute Comms;
    Parm      : Array[1..1,1..4] of ShortInt absolute Prms;
Var I        : Integer;
Begin
    For I:=1 to Count do
        Output_Face_Command(Commands[i],parm[i,1],Parm[i,2],Parm[i,3],parm[i,4]);
    end; {Drive face}
    {-----}
    PROCEDURE Show_Grim;
    Const Command : Array[1..5] of Keywords = (Eyes,Leye,Reye,Nose,Mouth);
        Parm      : Array[1..5,1..4] of ShortInt =
        ((-15,0,15,0),(0,-15,-10,0),(0,-15,-10,0),(10,0,0,0),(-10,-20,-10,0));
    Begin
        Drive_Face(Command,Parm,5);
    end; {grim}
    {-----}
    PROCEDURE Show_Sad;
    Const Command : Array[1..4] of Keywords = (Eyes,Leye,Reye,Mouth);
        Parm      : Array[1..4,1..4] of ShortInt =
        ((0,20,0,7),(20,0,-25,0),(20,0,-25,0),(-5,-50,10,0));
    Begin
        Drive_Face(Command,Parm,4);
    end; {sad}
    {-----}
    PROCEDURE Show_Fear;
    Const Command : Array[1..6] of Keywords = (Eyes,Leye,Reye,Mouth,Pupils,Nose);
        Parm      : Array[1..6,1..4] of ShortInt =
        ((25,20,25,0),(1,50,0,0),(1,50,0,0),(-25,-50,60,0),(3,0,0,0),(3,0,0,0));
    Begin
        Drive_Face(Command,Parm,6);
    end; {show_fear}
    {-----}
    PROCEDURE Show_Smile;
    Const Command : Array[1..4] of Keywords = (Mouth,Eyes,Leye,Reye);
        Parm      : Array[1..4,1..4] of ShortInt =
        ((5,35,20,0),(-10,0,5,0),(0,15,0,0),(0,15,0,0));
    Begin
        Drive_Face(Command,Parm,4);
    end; {Smile}
    {-----}
    PROCEDURE Show_Wink;
    Const Command : Array[1..6] of Keywords = (REye,Leye,Display,Wait,Reye,LEye);
        Parm      : Array[1..6,1..4] of ShortInt =
        ((100,-20,0,0),(0,30,0,0),(0,0,0,0),(127,0,0,0),(-100,20,0,0),(0,-30,0,0));
    Begin
        Drive_Face(Command,Parm,6);
    end; {Wink}
    {-----}
    PROCEDURE Move_Brows(Up: boolean);
    Const Scalar : Array[Boolean] of ShortInt = (-20,20);
    Begin
        Output_Face_Command(Leye,0,Scalar[up],0,0);
        Output_Face_Command(Reye,0,Scalar[up],0,0);
    end; {Move Brows}
    {-----}
    PROCEDURE Tilt_Left_Brows(Up: boolean);
    Const Scalar : Array[Boolean,1..3] of ShortInt = ((-20,-20,10),(20,20,-10));
    Begin
        Output_Face_Command(Leye,0,Scalar[up,1],Scalar[up,2],0);
        Output_Face_Command(Reye,0,Scalar[up,3],0,0);
    end; {tilt left brows}
    {-----}
    PROCEDURE Look_Around;
    Const Command : Array[1..7] of Keywords =
    (Eyes,Display,wait,eyes,display,wait,eyes);
        Parm      : Array[1..7,1..4] of ShortInt =
        ((0,0,0,-14),(0,0,0,0),(127,0,0,0),(0,0,0,28),(0,0,0,0),(127,0,0,0),(0,0,0,-14));
    Begin
        Drive_Face(Command,Parm,7);
    end; {look_around}
    {-----}

```

```

PROCEDURE Init_Face(What: Faces);
Const Default : Array[1..15] of ShortInt =
(15,15,-10,-10,0,4,1,1,10,0,10,-10,0,30,1);
Begin
  If What=fCTime then
    Move(Default,StoryFile.fInput.fData,SizeOf(Default));
  else Move(LastCompFace,StoryFile.fInput.fData,SizeOf(Default));
  OutPut(' ',AbsFace);
  If What=fGrim then Show_Grim else
    If What=fSad then Show_Sad;
end; {init face}
{-----}
FUNCTION Describe_Story(Caps: Boolean): Integer;
Begin
  Spoke:=False;
  UseCaps:=Caps;
  With AStoryRec,StoryFile do
  Begin
    If (NowPorpoisePtr<>LastNowPorpoisePtr) then
      Begin
        Problem_Phrase(AnyTerm);
        If TheStratName<>' ' then
          Strategy_Phrase(Anyterm);
        end;
        If (HitSiNode<>LastStoryrec.HitSiNode) then
          If (PlanName<>' ') and (SGName<>' ') then
            Plan_Phrase(Anyterm)
          else
            If (SGName<>' ') then Node_Phrase(Anyterm);
          If (NextSiNode<>LastStoryrec.NextSiNode) and
            (NextSGName<>' ') then
            NextNode_Phrase(Anyterm);
          If (NowDSD<>LastStoryrec.NowDSD) then
            NewDecision_Phrase(Anyterm);
          If Spoke then
            Describe_Arousals(AnyTerm);
        end;
        Describe_Story:=StoryFile.fIOresult;
      end; {describe story}
    {-----}
  END;
PROCEDURE Intro_Phrase;
Var T1,T2,T3,T4: String[70];
Begin
  Init_Face(fCTime);
  UseCaps:=True;
  Which:=Determine_Which(Which,6);
  Case Which of
    1: Begin
      T1:=Instantly_Terms(anyterm,false,false)+' , ' ;
      T2:='while'+In_Terms(AnyTerm,True,True)+MainFileName+' is ' ;
      T3:='where it''s';
      T4:=Really_Terms(True,True)+Happening_Terms(False,False)+' . ' ;
    end;
    2: Begin
      T1:='Well, ' ;
      T2:='I''m'+In_Terms(AnyTerm,True,True)+MainFileName+' and it''s
+Today;
      T3:=' as it''s all';
      T4:=Really_Terms(True,True)+Happening_Terms(False,False)+' . ' ;
    end;
    3: Begin
      T1:='It''s a dark and'+Really_Terms(true,true)+'stormy night,
+UserName+' , ' ;
      T2:='and I''m'+In_Terms(AnyTerm,True,True)+MainFileName+' , ' ;
      T3:='as I'+Usually_Terms(True,True)+'am, ' ;
      T4:='minding my own business.' ;
    end;
    4: Begin
      T1:='You won''t believe this, ' ;
      T2:='but so help me ' ;
      T3:='every word is'+Really_Terms(True,True)+'true. ' ;
      T4:='It''s '+Today+' and

```

```

I'm'+In_Terms(AnyTerm,True,True)+MainFileName+'. ' ;
    end;
5: Begin
    T1:=Instantly_Terms(anyterm,false,false)+', ' ;
    T2:='I'm'+In_Terms(AnyTerm,True,True)+MainFileName+'. ' ;
    T3:='on '+Today+' ' ;
    T4:='and things are
'+becoming_Terms(false,false)+Really_Terms(True,True)+'bad. ' ;
    end;
6: Begin
    T1:=Instantly_Terms(anyterm,false,false)+', ' ;
    T2:='it's all'+Began_Terms(AnyTerm,True,True);
    T3:='while I'm'+In_Terms(AnyTerm,True,True);
    T4:=MainFileName+'. ' ;
    end;
end;
Sound_And_Text(VNorm,PHi,T1);
Show_Blink;
Sound_And_Text(VNorm,PNorm,T2);
Show_Fear;
Sound_And_Text(VNorm,PHi,T3);
Sound_And_Text(VSoft,PNorm,T4);
Show_Blink;
end; {intro phrase}
{-----}
PROCEDURE Problem_Phase;
Var temp : String[80];
Begin
    Which:=Determine_Which(Which,7);
    Case Which of
        1: Begin
            temp:='the'+problem_Terms(AnyTerm,True,True);
            Sound_And_Text(VNorm,PHi,temp);
            Look_Around;
            Sound_And_Text(VSoft,PNorm,'that's facing me
'+Instantly_Terms(Anyterm,False,True));
            Show_Blink;
            Sound_And_Text(VSoft,PHi,'is '+ProblemName+'. ');
        end;
        2: Begin
            Sound_And_Text(VNorm,PHi,'I'm'+Really_Terms(True,True)+'trying
');
            Look_Around;
            Sound_And_Text(VSoft,PNorm,'to avoid '+ProblemName+'. ');
            Show_Blink;
        end;
        3: Begin
            Init_Face(FSad);
            Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(AnyTerm,True,True)+'to have a' +
                Problem_Terms(AnyTerm,True,True));
            Look_Around;
            Sound_And_Text(VSoft,PNorm,'trying to avoid ' +ProblemName+'.
');
        end;
        4: Begin
            If Caps then ProblemName[1] := UpCase(ProblemName[1]);
            Sound_And_Text(VNorm,PHi,ProblemName+' is ');
            Tilt_Left_Brows(True);
            Sound_And_Text(VNorm,PNorm,Really_Terms(False,True)+'a'+Problem_Terms(AnyTerm,True
,True)+'for me. ');
            Show_Blink;
        end;
        5: Begin
            Init_Face(FSad);
            temp:='talk about a' +Problem_Terms(AnyTerm,True,False)+'--';
            Sound_And_Text(VNorm,PNorm,temp);
            Show_Blink;
            Output_Face_Command(Eyes,0,0,0,7);
            Sound_And_Text(VNorm,PLO,'the one I am'
                +Really_Terms(true,true)+'facing is '+ProblemName+'. ');
        end;
    end;
end;

```

```

6: Begin
    Init_Face(FSad);
    Sound_And_Text(VNorm,PHiHi,Instantly_Terms(AnyTerm,False,False)+' ',' ');
    Show_Blink;
    Output_Face_Command(Eyes,0,0,0,7);
    Sound_And_Text(VNorm,PLO,'I''m confronting a new
'+Problem_Terms(AnyTerm,False,false)
    +', '+ProblemName+' ' ');
    end;
7: Begin
    Init_Face(FSad);
    temp:=ProblemName+' is the'+problem_Terms(AnyTerm,True,True);
    Sound_And_Text(VNorm,PNorm,temp);
    Show_Blink;
    Output_Face_Command(Eyes,0,0,0,7);
    Sound_And_Text(VNorm,PLO,'that is'+
    Becoming_Terms(true,true)+'an aggravation. ');
    end;
    end;
    UseCaps:=True;
end; (problem phrase)
{-----}
PROCEDURE Strategy_Phrase;
Begin
    Which:=Determine_Which(Which,6);
    If Which<>6 then Init_Face(fGrim);
    Case Which of
        1: Sound_And_Text(VNorm,PHi,'so, of course,
I'+Planned_To_Terms(AnyTerm,True,True)+TheStratName+' ');
        2: Begin
            Sound_And_Text(VNorm,PHi,'all I'+Really_Terms(True,True)+'care
about is ');
            Output_Face_Command(Eyes,0,0,0,7);
            Sound_And_Text(VNorm,PNorm,'that
I'+Planned_To_Terms(AnyTerm,True,True)+TheStratName+' ');
            end;
        3: Begin
            Sound_And_Text(VNorm,PHi,'to '+TheStratName+' ');
            Sound_And_Text(VSoft,PNorm,'is what
I'+Really_Terms(True,True)+'am focused on. ');
            end;
        4: Begin
            Sound_And_Text(VNorm,PHi,'I know if I can ' +TheStratName+' ');
            Show_Blink;
            Sound_And_Text(VSoft,PNorm,'I
will'+Usually_Terms(True,True)+'be all right'
            +very_Soon_Terms(true,false)+' ');
            end;
        5: Begin
            Output_Face_Command(Eyes,0,0,0,-14);
            Sound_And_Text(VNorm,PHi,'if I can only '+TheStratName+' ');
            Output_Face_Command(Eyes,0,0,0,14);
            Sound_And_Text(VSoft,PNorm,'my'
+Problem_Terms(AnyTerm,True,True)+' will end. ');
            end;
        6: Begin
            Output_Face_Command(Eyes,0,0,0,-14);
            Sound_And_Text(VNorm,PHi,'but I
can'+Usually_Terms(True,True)+'handle it ');
            Output_Face_Command(Eyes,0,0,0,14);
            Sound_And_Text(VSoft,PNorm,'if I can only '+TheStratName+' ');
            end;
    end;
    UseCaps:=True;
end; (strategy phrase)
{-----}
PROCEDURE Decision_Phase;
Begin
    Which:=Determine_Which(Which,7);
    If Which<5 then Init_Face(fNorm);
    Case Which of

```

```

1: Begin
Sound_And_Text(VNorm, PHi, instantly_Terms(anyterm, False, False)+' , ');
      Sound_And_Text(VNorm, PNorm, 'I am'+
Began_Terms(AnyTerm, True, True)+' to '+DfltDSDName+' ');
      Show_Fear;
Sound_And_Text(VNorm, PLo, 'while'+becoming_Terms(true, true)+'concerned');
      Sound_And_Text(VSoft, PLo, 'and'+Looking_For_Terms(True, True)+'a
plan. ');
      end;
2: Begin
      Sound_And_Text(VNorm, PNorm, 'I'm getting my brain in gear ');
      Show_Blink;
Sound_And_Text(VNorm, PLo, 'and'+Began_Terms(AnyTerm, True, false)+' to
'+DfltDSDName+' ');
      end;
3: Begin
Sound_And_Text(VSoft, PNorm, 'while'+Decision_Terms(AnyTerm, True, True));
      Move_Brows(True);
      Sound_And_Text(VSoft, PHi, 'what else I might do, ');
      Move_Brows(False);
      Show_Blink;
      Sound_And_Text(VNorm, PNorm, 'I
am'+Began_Terms(AnyTerm, True, True)+' to '+DfltDSDName+' ');
      Show_Smile;
      end;
4: Begin
      Sound_And_Text(VNorm, PNorm, Right_Now_Terms(False, False)+' , I
am');
      Show_Blink;
      Sound_And_Text(VNorm, PNorm, Began_Terms(AnyTerm, True, True)+' to
'+DfltDSDName+' ');
      Show_Smile;
      Output_Face_Command(Eyes, 0, 0, 0, -14);
      Sound_And_Text(VNorm, PLo, ' and worrying less ');
      Output_Face_Command(Eyes, 0, 0, 0, 14);
      Sound_And_Text(VNorm, PLo, ' while'
+Decision_Terms(AnyTerm, True, True)+'my ');
      Move_Brows(True);
      Sound_And_Text(VNorm, PLo, 'next step. ');
      end;
5: Begin
      Sound_And_Text(VNorm, PNorm, 'so I'm');
      Show_Blink;
      Sound_And_Text(VNorm, PLo, Began_Terms(AnyTerm, True, True)+' to
'+DfltDSDName
      +instantly_terms(anyterm, true, false)+' ');
      end;
6: Begin
Sound_And_Text(VNorm, PNorm, Instantly_Terms(anyterm, False, False)+
      ' , I'm '+Decision_Terms(AnyTerm, False, True));
      Show_Blink;
      Sound_And_Text(VNorm, PLo, 'to start to '+DfltDSDName+' ');
      Show_Smile;
      end;
7: Begin
      Sound_And_Text(VNorm, PNorm, 'so, ');
      Show_Blink;
Sound_And_Text(VNorm, PNorm, 'while'+Looking_For_Terms(True, True)+'some plan, ');
      Show_Smile;
      Output_Face_Command(Eyes, 0, 0, 0, -14);
Sound_And_Text(VNorm, PLo, 'I'm'+Began_Terms(AnyTerm, True, True)+' to
'+DfltDSDName+' ');
      Move_Brows(True);
      end;
      end;
      UseCaps:=True;
end; {Decision phrase}
{-----}
PROCEDURE Plan_Phase;
Begin
      Which:=Determine_Which(Which, 8);
      Init_Face(FNorm);

```



```

      Case Which of
      1 : Begin
Sound_And_Text (VNorm, PHi, Instantly_Terms (anyterm, False, False) + ', I am ' + SGName +
');
          Tilt_Left_Brows (True);
          Sound_And_Text (VNorm, PNorm, 'and
I'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' . ');
          Show_Blink;
      end;
      2 : Begin
          Sound_And_Text (VNorm, PHi, 'I find myself ' + SGName + ' ');
          Show_Blink;
          Show_Grim;
Sound_And_Text (VNorm, PNorm, 'and'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' .
');
      end;
      3 : Begin
          Sound_And_Text (VSoft, PLo, 'so here I am, ');
          Show_Blink;
          Sound_And_Text (VSoft, PLo, SGName + ' ');
          Tilt_Left_Brows (True);
          Sound_And_Text (VNorm, PNorm, 'and
I'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' . ');
      end;
      4 : Begin
          Sound_And_Text (VSoft, PLo, 'anyway, ');
          Show_Wink;
          Sound_And_Text (VSoft, PLo, 'I am ' + SGName + ' ');
          OutPut_Face_Command (Eyes, 0, 0, 0, -7);
Sound_And_Text (VSoft, PNorm, 'and'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' .
');
      end;
      5 : Begin
          Sound_And_Text (VNorm, PHi, 'here I'm ' + SGName + ' ');
          Tilt_Left_Brows (True);
          Sound_And_Text (VNorm, PNorm, 'but
I'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' next. ');
          Show_Blink;
      end;
      6 : Begin
Sound_And_Text (VSoft, PLo, Instantly_Terms (anyterm, False, False) + ' I'm ');
          Show_Blink;
          Sound_And_Text (VSoft, PLo, SGName + ' ');
          Tilt_Left_Brows (True);
          Sound_And_Text (VNorm, PNorm, 'but next
I'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' . ');
      end;
      7 : Begin
Sound_And_Text (VSoft, PLo, Instantly_Terms (anyterm, False, False) + ', while I'm ');
          Show_Wink;
          Sound_And_Text (VSoft, PLo, SGName + ' ');
          OutPut_Face_Command (Eyes, 0, 0, 0, -7);
Sound_And_Text (VSoft, PNorm, 'I'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' . ');
      end;
      8 : Begin
          Sound_And_Text (VSoft, PNorm, 'I
next'+Planned_To_Terms (AnyTerm, True, True) + PlanName + ' ');
          Show_Blink;
          Sound_And_Text (VSoft, PLo, 'from where I am now ' + SGName + ' . ');
          OutPut_Face_Command (Eyes, 0, 0, 0, -10);
      end;
      end;
      UseCaps:=True;
end; {plan phrase}
{-----}
PROCEDURE Node_Phase;
Var St : String[40];
Begin
    Which:=Determine_Which (Which, 7);
    Init_Face (fNorm);
    Case Which of
        1 : St:='I am';

```

```

2 : St:='I find myself';
3 : St:=Instantly_Terms(anyterm,false,false)+' , I find myself';
4 : St:='here I am';
5 : St:=Instantly_Terms(anyterm,false,false)+' , I am';
6 : St:='I'm here';
7 : St:='I'm';
end; {case}
If SGName[1]<>' ' then St:=St+' ';
Sound_And_Text(VNorm,PHi,St+SGName+' ');
Move_Brows(True);
UseCaps:=True;
end; {node phrase}
{-----}
PROCEDURE NextNode_Phrase;
Var St : SString[40];
Begin
  Which:=Determine_Which(Which,6);
  Init_Face(fGrim);
  Case Which of
    1 : St := 'I';
    2 : St := 'but I';
    3 : St := 'so I';
    4 : St := 'I know I';
    5 : St := 'without a doubt, I';
    6 : St := 'obviously, I';
  end; {Case}
  Sound_And_Text(VLoud,PHi,St+Really_Terms(True,True));
  Sound_And_Text(VNorm,PHi,Need_To_Be_Terms(AnyTerm,False,True)+NextSGName+' ');
  UseCaps:=True;
end; {next node phrase}
{-----}
PROCEDURE NewDecision_Phrase;
Begin
  Which:=Determine_Which(Which,8);
  Init_Face(FNorm);
  Case Which of
    1 : Begin
      Output_Face_Command(Eyes,0,0,0,8);
      Sound_And_Text(VNorm,PHi,'I am'+Began_Terms(Which,True,True));
      Sound_And_Text(Vnorm,PNorm,'to '+NowDSDName);
      Show_Blink;
      Show_Smile;
      Sound_And_Text(VNorm,PNorm,
while'+hoping_Terms(true,true)+'for the best. ');
      end;
    2 : Begin
      Sound_And_Text(VLoud,PHi,'so, ');
      Show_Blink;
      Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
      Sound_And_Text(Vnorm,PHi,'to '+NowDSDName+' ');
      end;
    3 : Begin
      Sound_And_Text(VSoft,PLO,'to get to where I'm going, ');
      Look_Around;
      Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
      Tilt_Left_Brows(True);
      Sound_And_Text(Vnorm,PHi,'to '+NowDSDName+' ');
      end;
    4 : Begin
      Sound_And_Text(VSoft,PNorm,'to move along my plan, ');
      Output_Face_Command(Eyes,0,0,0,8);
      Output_Face_Command(Eyes,0,0,0,-12);
      Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
      Sound_And_Text(Vnorm,PHi,'to '+NowDSDName+' ');
      end;
    5 : Begin
      Tilt_Left_Brows(True);
      Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
      Sound_And_Text(VNorm,PHi,'to '+NowDSDName+' ');
      Show_Smile;

```

```

Sound_And_Text(VNorm,PNorm,Hoping_Terms(False,True)+'to get to where I'm going.
');
    end;
6 : Begin
    Show_Blink;
Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
    Sound_And_Text(VNorm,PLO,'to '+NowDSDName+', ');
    Look_Around;
    Sound_And_Text(VNorm,PNorm,Hoping_Terms(False,True)+'my plan
works out. ');
    end;
7 : Begin
    Sound_And_Text(VLoud,PHi,'anyway,
'+Hoping_Terms(False,True)+'for the best, ');
    Show_Blink;
Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
    Sound_And_Text(VNorm,PLO,'to '+NowDSDName+', ');
    end;
8 : Begin
    Sound_And_Text(VLoud,PHi,'looking ahead, ');
    Show_Blink;
Sound_And_Text(VNorm,PNorm,'I'm'+Began_Terms(Which,True,True));
    Sound_And_Text(VNorm,PLO,'to '+NowDSDName+', ');
    end;
end;
UseCaps:=True;
end; {new decision}
{-----}
PROCEDURE Then_Phrase;
Var St : String[20];
Begin
    UseCaps:=True;
    Case Determine_Which(Which,7) of
        1 : St:='Then';
        2 : St:='Later';
        3 : St:='After a while';
        4 : St:='After that';
        5 : St:='Next';
        6 : St:='Then after that';
        7 : St:='Next thing';
    end;
    OutPut(Spacing[Prefix]+st+', '+Spacing[Suffix],Say);
    UseCaps:=False;
end; {then phrase}
{-----}
PROCEDURE Friend_Phrase;
Var T1,T2 : String[80];
Begin
    UseCaps:=True;
    Which:=Determine_Which(AnyTerm,6);
    If Which<4 then
        Begin
            Case Which of
                1: Begin
                    Init_Face(fCTime);
                    T1:='your'+Friend_Terms(AnyTerm,True,True)+HeroName+' ';
                    T2:='could'+Really_Terms(True,True)+'use your help and
advice, '+UserName+' ';
                    end;
                2: Begin
                    Init_Face(fNorm);
                    T1:='I tell you, '+UserName+' ';
                    T2:='your'+Friend_Terms(AnyTerm,True,True)+
                    HeroName+' is'+Really_Terms(True,True)+'in trouble. ';
                    end;
                3: Begin
                    Init_Face(fNorm);
                    T1:='listen '+UserName+' ';
                    T2:='this time your'+Friend_Terms(AnyTerm,True,True)+
                    HeroName+' is'+Really_Terms(True,True)+'in a pickle.
';
                    end;
            end;
        end;
    end;
end;

```

```

        end; {Case}
        Show_Wink;
        Sound_And_Text(VNorm, PLo, T1);
        Show_Blink;
        Show_Smile;
        Sound_And_Text(VNorm, PNorm, T2);
    end;
    UseCaps:=True;
end; {Friend phrase}
{-----}
PROCEDURE Last_Phrase;
Const Words: Array[1..5] of String[12] =
    ('at last,', 'finally,', 'so finally,', 'in the end,', 'so at last,');
    EndPhrase : Array[0..1] of String[20] =
    (' I reached my goal. ', ' my problem ended. ');
Begin
    Which:=Determine_Which(Which, 5);
    UseCaps:=True;
    Init_Face(fCTime);
    Case PalDead of
        False : Begin
            If SGName<>' ' then
                Sound_And_Text(VSoft, PNorm, Words[Which]+' I''m
'+SGName+' . ')
            else
                Sound_And_Text(VSoft, PNorm, Words[Which]+EndPhrase[Random(2)]);
                Describe_Arousals(AnyTerm);
            end;
            True : Sound_And_Text(VNorm, PNorm, Words[Which]+' I''m dead. ');
        end;
    UseCaps:=True;
end; {last phrase}
{-----}
PROCEDURE Get_Highest_Regs;
Var Element,
    Where,
    Count : integer;
    Regs : ByteArray;
    St : String[80];
Begin
    FillChar(Top3Arousals, SizeOf(Top3Arousals), 0);
    Move(AStoryRec.Arousals, Regs, SizeOf(Regs));
    Regs[Ord(PainJoyRate)] := 0; {NEVER talk about Pain, and always talk joy
(below)}
    FillChar(Top3Regs, SizeOf(Top3Regs), 0);
    TopRegVal:=0; {needed in story}
    AStoryRec.ValidRegCount:=0;
    (* First, get top 3 registers --*)
    With AStoryRec do
        For Count:=1 to 3 do
            Begin
                Where:=Find_Largest_Buffer_Value(Regs[9], 5);
                If (Where<>0) and (Regs[8+Where]<>0) then
                    Begin
                        Inc(ValidRegCount);
                        Where:=Where+8;
                        Top3Regs[ValidRegCount]:=Where;
                        If Regs[Where]>TopRegVal then
                            TopRegVal:=Regs[where];
                        Regs[Where]:=0;
                    end
                end;
            end;
            If (AStoryRec.ValidRegCount<3) and (Regs[Ord(TotalArousal)]>0) then
                Begin
                    Inc(AStoryRec.ValidRegCount);
                    Top3Regs[AStoryRec.ValidRegCount]:=Ord(TotalArousal);
                end;
        end;
    (*-- Now convert top 3 regs into strings... --*)
    With AStoryRec do
        For Count:=1 to ValidRegCount do
            Begin

```

```

St:=Amount_Of(Top3Regs[Count],0,255);
Case Top3Regs[Count] of
  8 : Top3Arousals[Count]:=St+Fear_Terms(AnyTerm,False,False);
  9 : Top3Arousals[Count]:=St+Surprise_Terms(AnyTerm,False,False);
  10 :
Top3Arousals[Count]:=St+Disappointed_Terms(AnyTerm,False,False);
  11 : Top3Arousals[Count]:=St+Frustrated_Terms(AnyTerm,False,False);
  12 : Top3Arousals[Count]:=St+Hopeless_Terms(AnyTerm,False,False);
  14 : Top3Arousals[Count]:=St+Anxious_Terms(AnyTerm,False,False);
end;
end;
end; {Get highest regs}
{-----}
PROCEDURE Describe_Arousals;
Var Next : Integer;
    Num : Integer;
    TempStr : String[150];
Begin
  Which:=Determine_Which(Which,3);
  If AStoryRec.ValidRegCount>0 then
  Begin
    Init_Face(fCtime);
    Case Which of
      1 : TempStr:='I'+Felt_Terms(AnyTerm,True,True)+Top3Arousals[1];
      2 : TempStr:='Mainly,
I'+Felt_Terms(AnyTerm,True,True)+Top3Arousals[1];
      3 : Begin
        OutPut_Face_Command(Eyes,0,0,0,7);
        TempStr:='I've noticed I'+Felt_Terms(AnyTerm,True,True)+
Top3Arousals[1];
      end;
    end;
    Sound_And_Text(VSoft,PHi,TempStr+'. ');
  end;
  If (AStoryRec.Arousals[13]<127) then
    Sound_And_Text(VNorm,PNorm,'I'm also feeling '+
    Amount_Of(AStoryRec.Arousals[13],0,127)+
    Better_Terms(anyterm,false,false)+'. ');
  end; {Describe arousals}
  {-----}
end.

{
  } Unit Story2; {
}

Purpose:
This unit controls the output of story text in record mode, and handles
the real time changes to the face if telling a story in realtime mode.
History:
3/26/91 : Last Ctime of story, only output conclusion phrase. RG
3/27/91 : If RiNum=AnyRi in convert_ri routine, kick out 1st SE.Ri. RG
6/26/91 : Added arousal output to story file. This is to let the PAL
talk 2 way about arousals in story files.
Copyright (c) 1989-1991 Anthrobotics

Interface {
Uses Types,BlockFile,PlayBack,SiStuff,DatList,newTypes,General;
Type StoryRecord = Record
  HitSiNode,
  NextSiNode,
  NowStratPtr,
  NowDsd,
  DfltDsd : PointPtr;
  ArousalLevel : integer;
  HitPlanRow,
  HitPlanNum : Byte;
  Arousals : ByteArray;
  ValidRegCount : Byte;
end; {storyrecord}
Const MinimumPain : Integer = 20;
    FearQuitLevel: Integer = 90;

```

```

MinimumJoy      : Integer = 90;
Top3Regs        : Array[1..3] of byte = (0,0,0);
TopRegVal       : Byte = 0;
Top3Arousals    : Array[1..3] of String[30] = ('','','');
Const ProblemName : String[80] = ''; {set in goalstuff: What_Now_Porpoise}
TheStratName    : String[80] = ''; {set in goalstuff: What_Now_Porpoise}
PlanName        : String[80] = ''; {set in goalstuff: Find_Strategy}
SGName          : String[80] = ''; {determined real time}
DfltDsdName     : String[80] = ''; {determined real time}
NowDsdName      : String[80] = ''; {determined real time}
NextSGName      : String[80] = ''; {determined real time}
Var AStoryRec,
    LastStoryRec : StoryRecord;
PROCEDURE Try_To_Save_Story;
FUNCTION Begin_Story(Var BeginStory: Boolean): Integer;
FUNCTION Conclude_Story: Boolean;
PROCEDURE Terminate_Run;
PROCEDURE Convert_Terms;
PROCEDURE Save_Sound(Tone, Volume, Pitch, Speed: Integer);
FUNCTION OutPut(S: Str150; Command: KeyWords): Integer;
PROCEDURE Expand_Synonyms(Var S: String; MaxLen: Word);
PROCEDURE Convert_Abstract_Ris_To_Pfs(Var Source: string);
PROCEDURE Convert_Ri_To_Rx(Var Source: String);
{ } Implementation { }
Uses Terms6, Terms5, Terms4, Terms2, Terms3, Terms1,
    SageTalk, Face2, RiStuff, Strucs,
    Printer, GrTool, GoalStuff, DsdStuff, Focus2, SxStuff,
    Relation, RxStuff1;
{-----}
PROCEDURE Save_Sound(Tone, Volume, Pitch, Speed: Integer);
Begin
    StoryFile.fCurrentCommand.Bytes[1] := Tone;
    StoryFile.fCurrentCommand.Bytes[2] := Volume;
    StoryFile.fCurrentCommand.Bytes[3] := Pitch;
    StoryFile.fCurrentCommand.Bytes[4] := Speed;
    OutPut('', Sounds);
end; {save sound}
{-----}
FUNCTION OutPut(S: Str150; Command: KeyWords): Integer;
Var I : Integer;
    Dont : Boolean;
Begin
    Dont := False;
    If S <> '' then
        StoryFile.fInput.fStr := S;
        StoryFile.fCurrentCommand.Command := Command;
        If (StoryFile.fFileOpen) then
            OutPut := StoryFile.mPut_Command
        else OutPut := 0;
        If OkToTalk then PlayBack_Command(storyfile, i, Dont);
    end; {Output}
{-----}
PROCEDURE Save_Composite_Face;
Var Speaking : Boolean;
Begin
    Speaking := OkToTalk;
    OkToTalk := True;
    OutPut('', Display); {Force first face update; compface was built in Face2}
    OkToTalk := Speaking;
end; {save composite face}
{-----}
FUNCTION Enough_Fear_For_A_Good_Story: Boolean;
{This routine tests to see if the genetic fear level of the current
goal is greater than some settable minimum. If not the brain isnt
scared enough to tell a good story, and it should stop talking.}
Begin
    Enough_Fear_For_A_Good_Story :=
        SubGoalPtr(NowPorpoisePtr)^.ASubGoal.Arousal > FearQuitLevel;
end; {enough fear for a good story}
{-----}

```

```

PROCEDURE Test_Arousal_MinMax;
  {This routine tests to see if the current arousal level is less than
   the lowest level of arousal so far, and if it exceeds the highest level
   of arousal so far. In either case, it saves the min and max.}
Begin
  If AStoryRec.ArousalLevel>ArousalMax then
    ArousalMax:=AStoryRec.ArousalLevel;
  If AStoryRec.ArousalLevel<ArousalMin then
    ArousalMin:=AStoryRec.ArousalLevel;
end; {Test arousal minmax}
{-----}
PROCEDURE Save_Arousal_Info;
  {This routine stores the 3 highest arousal registers into the
   current storyfile if the storyfile is open.}
Begin
  StoryFile.fCurrentCommand.Command:=ArousalInfo;
  Move(Top3Regs,StoryFile.fCurrentCommand.Bytes,3);
  StoryFile.fCurrentCommand.Bytes(4):=TopRegval;
  StoryFile.mPut_Command;
end; {save arousal info}
{-----}
PROCEDURE Try_To_Save_Story;
Var FaceShown : Boolean;
    BeginStory,
    Caps,
    ScaredEnuf : Boolean;
    I : integer;
Begin
  BeginStory:=False;
  FaceShown:=True;
  If Not OKToTalk then
    Save_Composite_Face
  else FaceShown:=False;
  Convert_Terms;
  With AStoryRec do
    If ((StoryFile.fValidStory) or
        (Begin_Story(BeginStory)=0)) then
      Begin
        FaceShown:=BeginStory;
        StoryFile.fIOresult:=0; {Clear former errors}
        If (StoryFile.fFileOpen) then
          Begin
            StoryFile.fCurrentCommand.Command:=CTimeMarker;
            StoryFile.fCurrentCommand.Long:=NowTime;
            StoryFile.mPut_Command;
          end;
          Inc(StoryFile.fCTimesSaved);
          ScaredEnuf:=Enough_Fear_For_A_Good_Story;
          If (NowPorpoisePtr<>LastNowPorpoisePtr) or
              (AStoryRec.HitSiNode<>LastStoryRec.HitSiNode) then
            Begin
              If ScaredEnuf then
                Begin
                  FaceShown:=Not BeginStory;
                  If Not BeginStory then
                    Then_Phrase(AnyTerm,True,True);
                  If (Not PalDead) then
                    If Describe_Story(BeginStory)=0 then;
                end;
              If BeginStory then
                Friend_Phrase(AnyTerm);
            end;
          end;
          Test_Arousal_MinMax;
          If StoryFile.fFileOpen then
            Save_Arousal_Info;
          If (Not ScaredEnuf) or (PalDead) then
            FaceShown:=Conclude_Story;
          LastStoryRec:=AStoryRec;
        end;
        If Not FaceShown then
          Save_Composite_Face;
      end; {Try to save story}
    end;
  end;

```

```

{-----}
FUNCTION Begin_Story(Var BeginStory: Boolean): Integer;
Var Which,
    Result : integer;
Begin
    With StoryFile do
        If (AStoryRec.ArousalLevel>=MinimumPain) then
            Begin
                BeginStory:=True;
                fValidStory:=True;
                FillChar(LastStoryRec,SizeOf(LastStoryRec),255);
                ArousalMax:=AStoryRec.ArousalLevel;
                ArousalMin:=AStoryRec.ArousalLevel;
                If (OutPut(' ',TopOfStory)=0) then
                    Begin
                        Intro_Phrase(Which);
                        StoryFile.fIOResult:=0;
                    end
                else Terminate_Run;
                Begin_Story:=0;
                FillChar(LastStoryRec,SizeOf(LastStoryRec),0);
            end
        else Begin_Story:=-1;
    end; {begin story}
{-----}
FUNCTION Conclude_Story: Boolean;
Begin
    Last_Phrase(AnyTerm);
    OutPut(' ',EndOfStory);
    StoryFile.fValidStory:=False;
    Conclude_Story:=True;
end; {conclude story}
{-----}
PROCEDURE Terminate_Run;
Begin
    If StoryFile.mClose=0 then;
        {Stop the run...}
        {Show error}
    end; {terminate run}
{-----}
FUNCTION Get_Ri_To_Talk_About(Var Source: Str150; Var Where: Integer): String;
Var Next,
    Temp : Str150;
    EndPos : Integer;
Begin
    Where:=Pos(' ',Source);
    If Where<>0 then
        Begin
            EndPos:=Pos(')',Source);
            If EndPos=0 then EndPos:=Succ(Length(Source));
            Get_Ri_To_Talk_About:=Copy(Source,Where+1,EndPos-Where-1);
            Delete(Source,Where,EndPos-Where+1);
        end
    else Get_Ri_to_Talk_About:='';
end; {Get ri to talk about}
{-----}
FUNCTION Convert_Ri_To_Pf(Var Source: String): Boolean;
Var AnRi : RiPtr;
    Num,fNum: Integer;
Begin
    AnRi:=RiPtr(RiList.Whose_Name(Source,true,num,fnum));
    If AnRi<>Nil then
        AnRi^.Get_Best_PF_Match(Source)
    else Source:='';
    Convert_Ri_To_Pf:=Source<>'';
end; {convert ri to pf}
{-----}
PROCEDURE Convert_Abstract_Ris_To_Pfs(Var Source: string);
Var I,Where : Integer;
    RiOrPF : String[20];
Begin
    Where:=0;

```



```

RiOrPf:=Get_Ri_To_Talk_About(Source,Where);
While (RiOrPf<>'') do
Begin
    If Convert_Ri_To_Pf(RiOrPf) then
        Insert(RiOrPf,Source,Where);
        RiOrPf:=Get_RI_To_Talk_About(Source,Where);
    end;
end; {convert abstract ris to pfs}
{-----}
PROCEDURE Lower_Case(Var Source: Str150);
Var I : integer;
Begin
    For I:=1 to Length(Source) do
        If (Source[i]>'@') and
            (Source[i]<'(') then Inc(Source[i],32);
    end; {lower case}
{-----}
FUNCTION Determine_Table(Var S: String): Integer;
Var Temp,Err: integer;
    SubSt : String(10);
Begin
    Temp:=0;
    While (S[temp+1] in ['0'..'9']) and (temp<4) do Inc(Temp);
    SubSt:=Copy(S,1,Temp);
    Delete(S,1,Temp);
    If SubSt<>' ' then
        Begin
            Val(SubSt,Temp,Err);
            If Err<>0 then Temp:=0;
        end
    else Temp:=0;
    Determine_Table:=Temp;
end; {determine table}
{-----}
FUNCTION Valid-Token(Var S: String; Var Table: Integer): Boolean;
Var TempSt: String;
Begin
    Table:=-1;
    If S[2] in ['0'..'9'] then
        Begin
            Delete(S,1,1);
            Table:=Determine_Table(S);
        end;
    Valid-Token:=Table>-1;
end; {valid token}
{-----}
PROCEDURE Get_Syn1(Var S: String; Table: Integer);
Var St: String(100);
    Suffix : Boolean;
Begin
    Suffix:=False;
    Case Table of
        {tables 0..10}
        0 : St:=Tired_Terms(false,suffix);
        1 : St:=Signif_Terms(false,suffix);
        2 : St:=A_Bit_Terms(false,suffix);
        3 : St:=Becoming_Terms(false,suffix);
        4 : St:=Possibly_Terms(false,suffix);
        5 : St:=Very_Much_Terms(AnyTerm,false,suffix);
        6 : St:=At_The_Terms(false,suffix);
        7 : St:=Right_By_The_Terms(false,suffix);
        8 : St:=Near_The_Terms(false,suffix);
        9 : St:=Far_From_The_Terms(false,suffix);
        10 : St:=Very_Soon_Terms(false,suffix);
        11 : St:=Moving_Terms(false,suffix);
    end;
    S:=St+S;
end; {Get syn 1}
{-----}
PROCEDURE Get_Syn2(Var S: String; Table: Integer);
Var ST : String(100);
    Suffix : Boolean;
Begin

```

```

Suffix:=False;
Case Table of
  12 : St:=Toward_The_Terms(false,suffix);
  13 : St:=From_The_Terms(false,suffix);
  14 : St:=Boredom_Terms(false,suffix);
  15 : St:=Better_Terms(AnyTerm,false,suffix);
  16 : St:=Little_Terms(AnyTerm,False,suffix);
  17 : St:=Sort_Of_Terms(AnyTerm,False,suffix);
  18 : St:=Usually_Terms(False,suffix);
  19 : St:=Move_Terms(false,suffix);
  20 : St:=Picnic_Terms(False,suffix);
  21 : St:=Pretty_Much_Terms(AnyTerm,False,suffix);
  22 : St:=A_Lot_Terms(AnyTerm,False,suffix);
end;
S:=St+S;
end; {Get syn 2}
{-----}
PROCEDURE Get_Syn3(Var S: SString; Table: Integer);
Var suffix : Boolean;
    St      : String[100];
Begin
  Suffix:=False;
  { suffix:=(S='') or (s[1]<>' '); }
  Case Table of {Tables 21..30}
    23 : St:=Looking_For_Terms(False,suffix);
    24 : St:=Really_Terms(False,suffix);
    25 : St:=Find_Terms(False,suffix);
    26 : St:=Arousal_Terms(False,suffix);
    27 : St:=Fleeing_Terms(False,suffix);
    28 : St:=Happening_terms(False,suffix);
    29 : St:=Staying_Still_Terms(False,suffix);
    30 : St:=Escape_Terms(false,suffix);
    31 : St:=Eat_Terms(False,suffix);
    32 : St:=Rest_Terms(False,suffix);
    33 : St:=Nearby_Terms(False,suffix);
    34 : St:=Play_Terms(False,suffix);
  end;
  S:=St+S;
end; {Get syn 3}
{-----}
PROCEDURE Insert_Synonym(Var S: SString; Table: Integer);
Begin
  If Table>22 then
    Get_Syn3(S,Table)
  else If Table>11 then
    Get_Syn2(S,Table)
  else Get_Syn1(S,Table);
end; {insert synonym}
{-----}
PROCEDURE Expand_Synonyms(Var S: SString; Maxlen: Word);
Var TokenPos, Table: Integer;
    TempSt      : SString;
Begin
  Convert_Abstract_Ris_To_Pfs(S);
  TempSt:='';
  Repeat
    TokenPos:=Pos('@',S);
    If (TokenPos>0) then
      Begin
        TempSt:=TempSt+Copy(S,1,TokenPos-1);
        Delete(S,1,TokenPos-1);
        If Valid_Token(S,Table) then
          Insert_Synonym(S,Table)
        else
          Begin
            TempSt:=TempSt+'@';
            Delete(S,1,1);
          end;
        end;
      end
    Until TokenPos=0;
  TempSt:=TempSt+S;
  S:=Copy(TempSt,1,MaxLen);

```

```

end; {expand synonyms}
{-----}
PROCEDURE Convert_Ri_To_Rx(Var Source: String);
(
  Purpose:
  Converts Ri in user identifier names to the actual Rx's that were used
  in SiMod and decision making.
  History:
  03/27/91 : If RiNum=AnyRi, kick out first SE.Ri.
)
Var RxName,
    RiName      : Str80;
    RiNum,
    RxCount,
    Where, I     : Integer;
    Pt          : PointPtr;
Begin
  RxName:= '';
  RiNum:=0;
  RiName:=Get_Ri_To_Talk_About(Source,Where); {Strip ri from identifier}
  While RiName<>' ' do
    Begin
      Pt:= RiList.Whoose_Name(RiName,True,RiNum,i);
      If Pt<>Nil then
        Begin
          RxCount:=RiPtr(Pt)^.Get_Best_Rx_Match(Sxx^,RxName);
          If RxCount=1 then
            Insert(RxName,Source,Where)
          else If (Convert_Ri_To_Pf(RiName)) then
            Begin
              Insert(RiName,Source,Where);
              RxName:=RiName
            end
          else Insert('<UNKNOWN>',Source,Where);
        end
      else
        If (UpCase_String(RiName)='HIT') then
          Begin
            RxName:=BrainRow^.SxRowRec.RelRow^.SxRowRec.Kind^.RxRec.Name;
            Insert(RxName,Source,Where);
          end
        else
          Insert('<NOHIT>',Source,Where);
          RiName:=Get_Ri_To_Talk_About(Source,Where); {Strip ri from identifier}
        end;
        Expand_Synonyms(Source,255);
      end; {Convert ri to rx}
    end;
  {-----}
PROCEDURE Convert_Terms;
Var S : String[150];
    P : Pointer;
Begin
(DEBUG
  Put_Text('Time: '+Int_Str(NowTime,1),10,10,15,True);
DEBUG)
  Convert_Ri_To_Rx(ProblemName);
  If (AStoryRec.HitSiNode<>Nil) then
    Begin
      SGName:=AStoryRec.HitSiNode^.Who_Am_I^;
      If SGName<>' ' then
        Convert_Ri_to_Rx(SGName)
      end
    else SGName:= '';
    If AStoryRec.NextSiNode<>Nil then
      Begin
        NextSGName:=AStoryRec.NextSiNode^.Who_Am_I^;
        If NextSGName<>' ' then
          Convert_Ri_To_Rx(NextSGName)
        end
      else NextSGName:= '';
      If (AStoryRec.NowStratPtr<>Nil) then {Plan/Strategy names already set in
actions}
        Begin

```

```

        If TheStratName<>' ' then
            Convert_Ri_To_Rx(TheStratName);
        If PlanName<>' ' then
            Convert_Ri_To_Rx(PlanName);
        end;

    If AStoryRec.DfltDsd<>Nil then
        Begin
            DfltDsdName:=AStoryRec.DfltDsd^.Who_Am_I^;
            If DfltDsdName<>' ' then
                Convert_Ri_To_Rx(DfltDsdName);
            end
        else DfltDsdName:=' ';

    If AStoryRec.NowDsd<>Nil then
        Begin
            NowDsdName:=AStoryRec.NowDsd^.Who_Am_I^;
            If NowDsdName<>' ' then
                Convert_Ri_To_Rx(NowDsdName);
            end
        else NowDsdName:=' ';
        Get_Highest_Regs;

    {DEBUG
      With AStoryRec do
        Begin
            Writeln(Lst,'-----['',NowTime,'']-----');
            Writeln(Lst,'Problem : ',problem,' Ptr =
',seg(nowporpoisePtr^),'',ofs(nowporpoisePtr^));
            Writeln(Lst,'Strat   : ',Thestrat,' Ptr =
',seg(Strat^),'',ofs(Strat^));
            Writeln(Lst,'Plan    : ',Plan);
            Writeln(Lst,'SINode   : ',SG,' Ptr = ',seg(SiNode^),'',ofs(SiNode^));
            Writeln(Lst,'NextNode: ',NextSG,' Ptr =
',seg(NextNode^),'',ofs(NextNode^));
            Writeln(Lst,'DfltDSD : ',Story2.DfltDSD,' Ptr =
',seg(AStoryRec.DfltDSD^),'',ofs(AStoryRec.DfltDsd^));
            Writeln(Lst,'NowDSD  : ',Story2.NowDSD,' Ptr =
',seg(AStoryRec.NowDSD^),'',ofs(AStoryRec.NowDsd^));
            Writeln(Lst);
        end;
    DEBUG)

    end; {convert terms}

    {-----}

    {
        Unit Initialization
    }

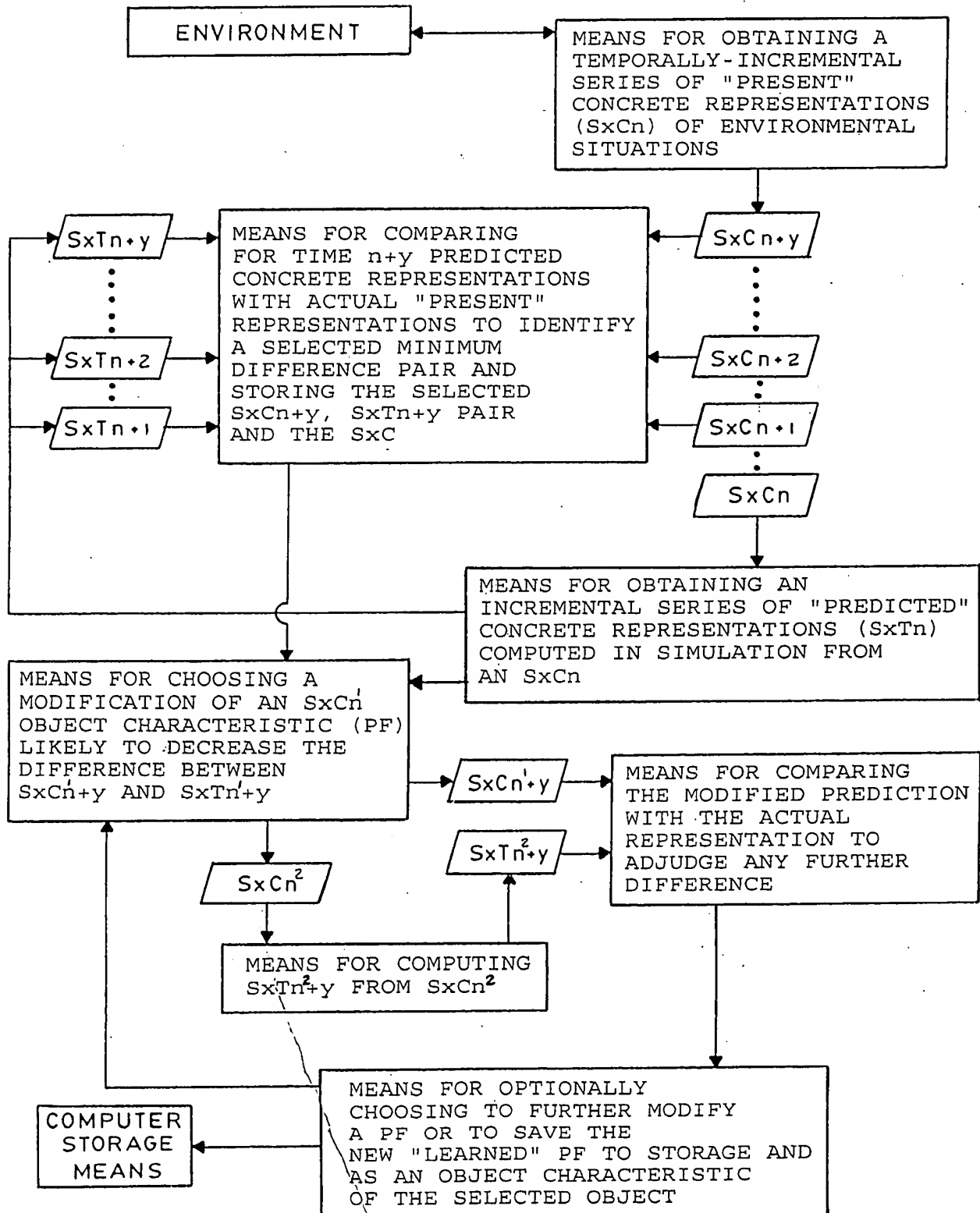
    end. {story2 unit}

```

# FIG. 10A

37/62

## REPRESENTATIVE FLOW CHART FOR COGNITIVE LEARNING



STEPS IN A COMPUTER PROGRAM FOR IMPLEMENTING  
RELEVANCY LEARNING IN AN AUTONOMOUS DECISION SYSTEM

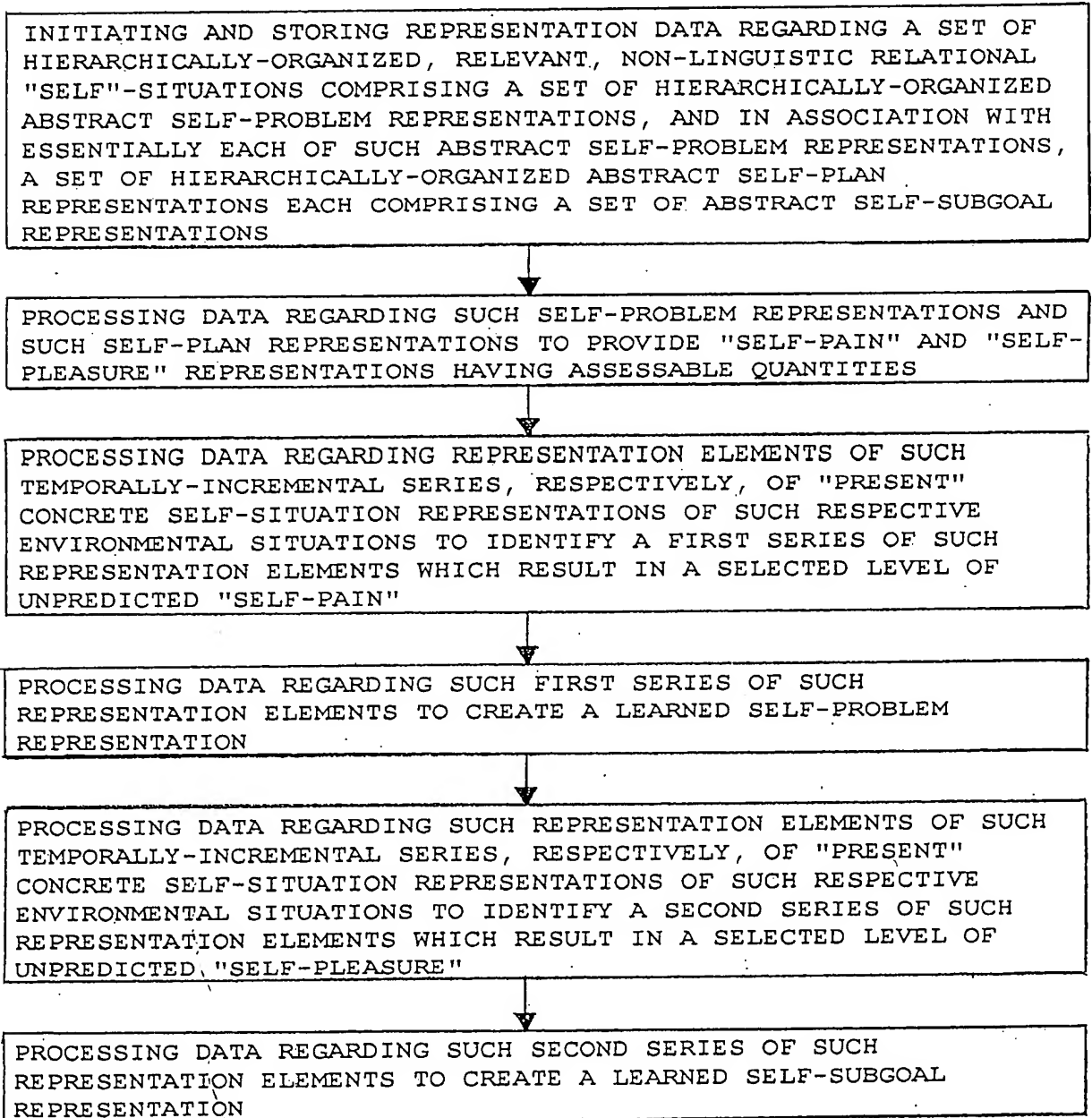


FIG 11

39/62

## HIGH LEVEL FLOW CHART OF ENTERTAINMENT SYSTEM

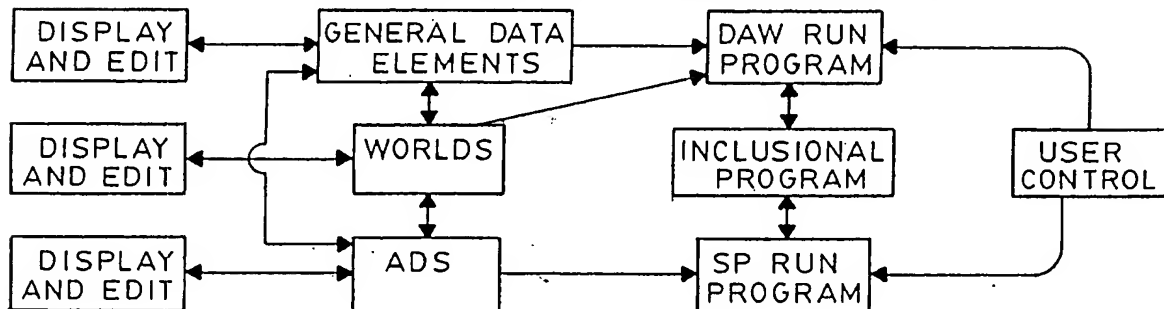


FIG. 12

## SUMMARY OF PRIMARY SOFTWARE SYSTEMS AND FUNCTIONS

## World:

## Data Building/Saving Interfaces

Writing RF data	Writing RFM data
Writing PFM data	Writing Ri/Pi/ data
Writing r data	Writing Si data
Writing dsd data	Writing PF data
Writing SCAN data	Writing Metabolism Choices

## Object Building/Saving Interfaces

- Selecting an Object Name
- Selecting RF's
- Selecting Doings and Animation
- Selecting Meta-PF's

## Meta-PF Building/Saving Interfaces

- Writing Meta-PF's

## World Building/Saving Interfaces

- Selecting a World Name
- Selecting an Object
- Plunking an Object

## World Incremental Simulation

## ADS:

## Data Building Interfaces

Writing Problem Nodes:	Writing Plan Nodes: hierarchy,
hierarchy, Sip, dD	Sigp, dD, dTd, dc

- Writing Emotional Attributes

- Writing Facial/Emotional Attributes

- Writing SCAN modes

- Writing Questions

- Writing Story/Answer Snippets

- Writing Story/Answer Synonyms

## Selecting ADS Attributes

- Selecting IQ

- Selecting Emotion/Face Attributes

- Selecting Story Start/Stop Attributes

## Overall ADS-Run Systems

- Sensing What Situation

- Recognizing What Situation

- Deciding What Problem Node

- Deciding What Plan Node

- Look-For System to SCAN

- Emotional/Facial System

- Story-Telling System

- Question-Answering System

- Predicting Threats and Opportunities

- Making Action Decisions

## Run:

- Selecting Screens To Show: World,
- Radar, Metabolism, Face

- Selecting a World

- Plunking an ADS

- Selecting Tell/Story Modes

- Selecting Run Modes

- Stopping and Starting

FIG. 13

40/62

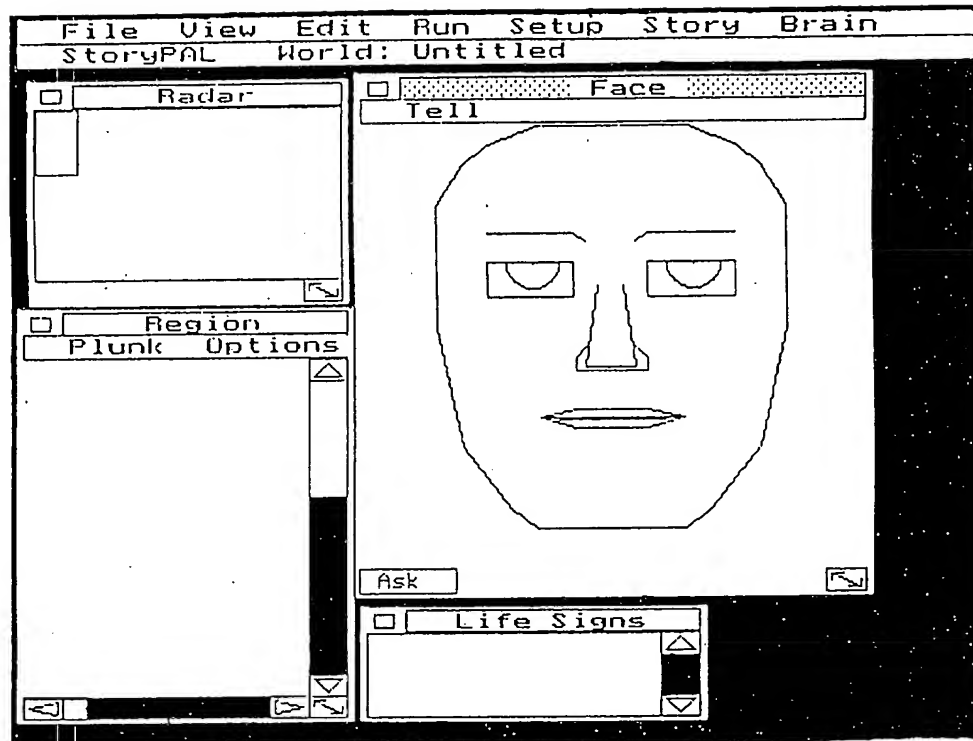


FIG. 14

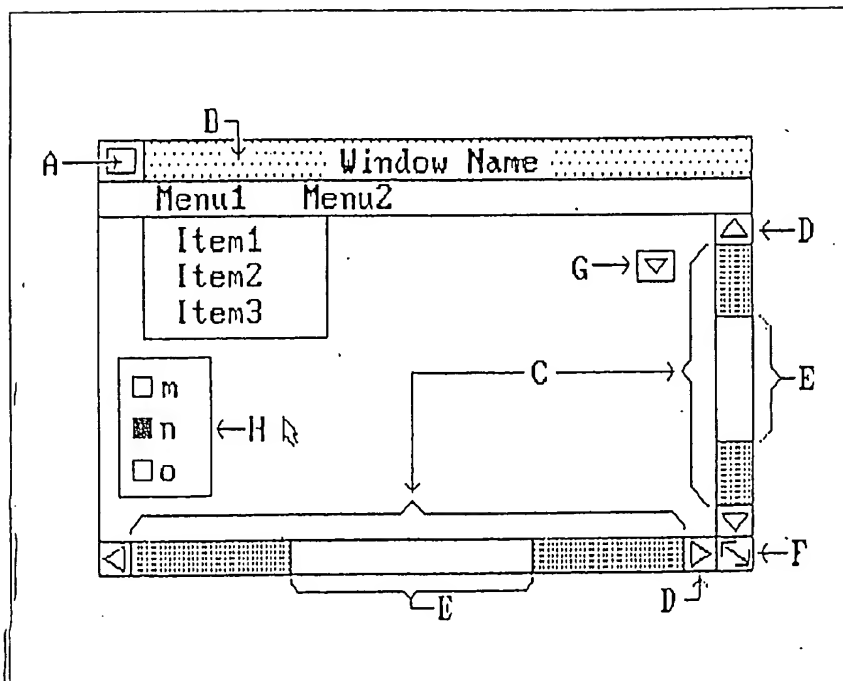


Figure 1: Window features



FIG. 15

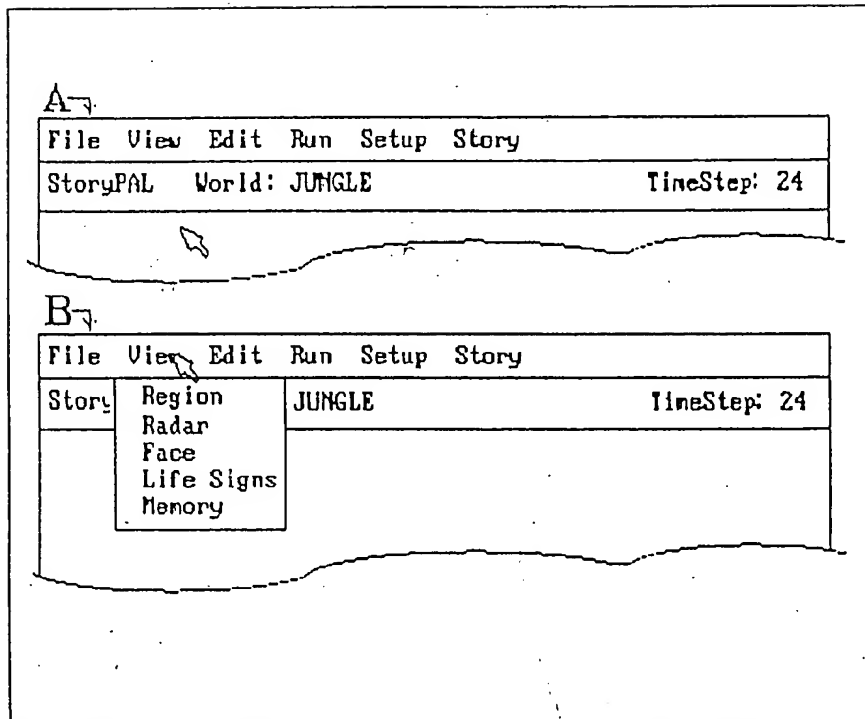


Figure 2: The Main Screen: A - No menus open, and B - the View menu open

FIG. 16

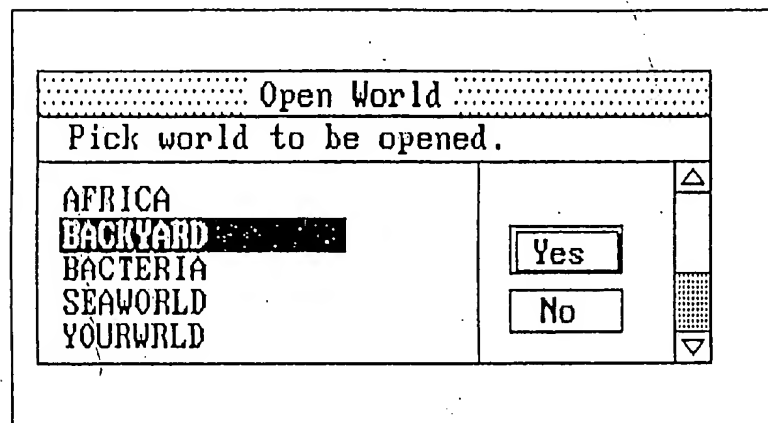


Figure 3: What you see when you click on Open

FIG. 17

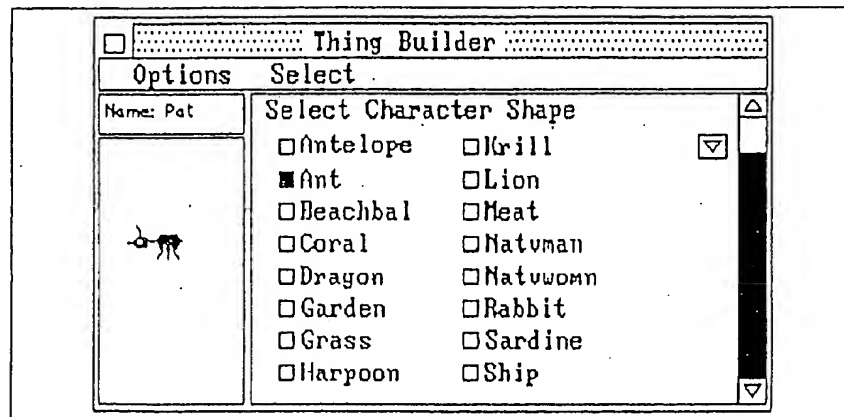


Figure 4: The Thing Editor window, with several sub-windows

FIG. 18

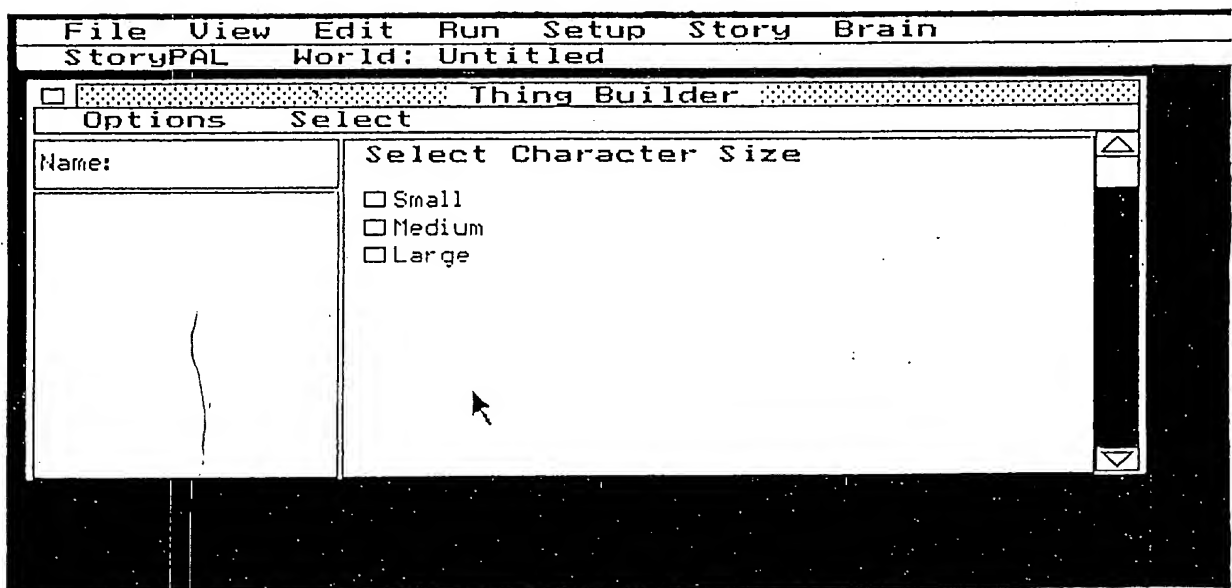


FIG. 19

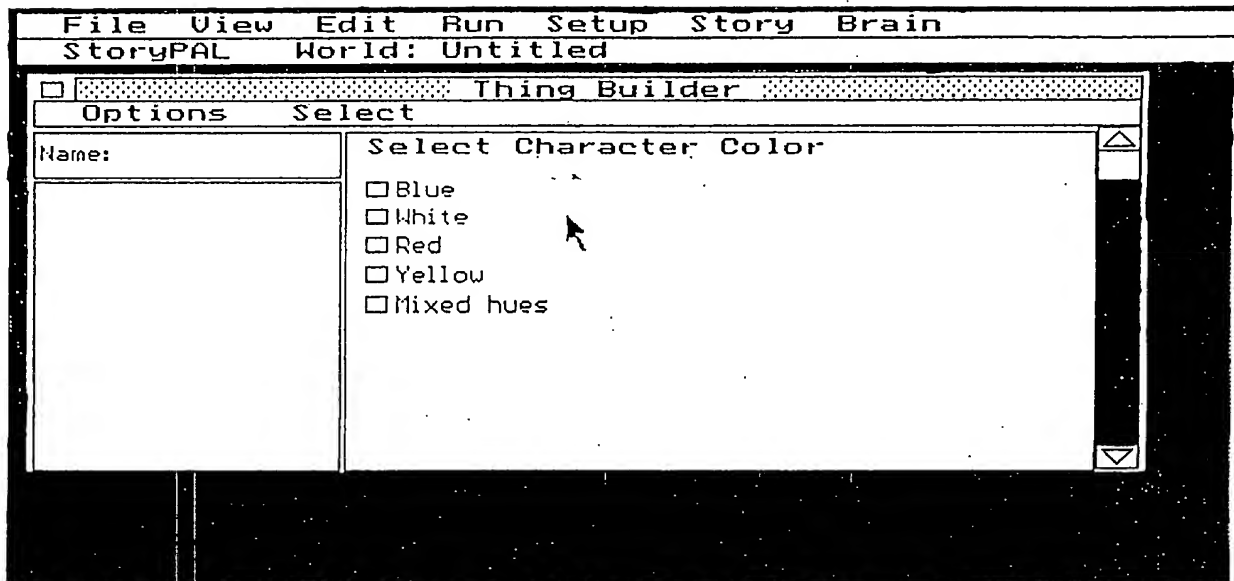


FIG. 20

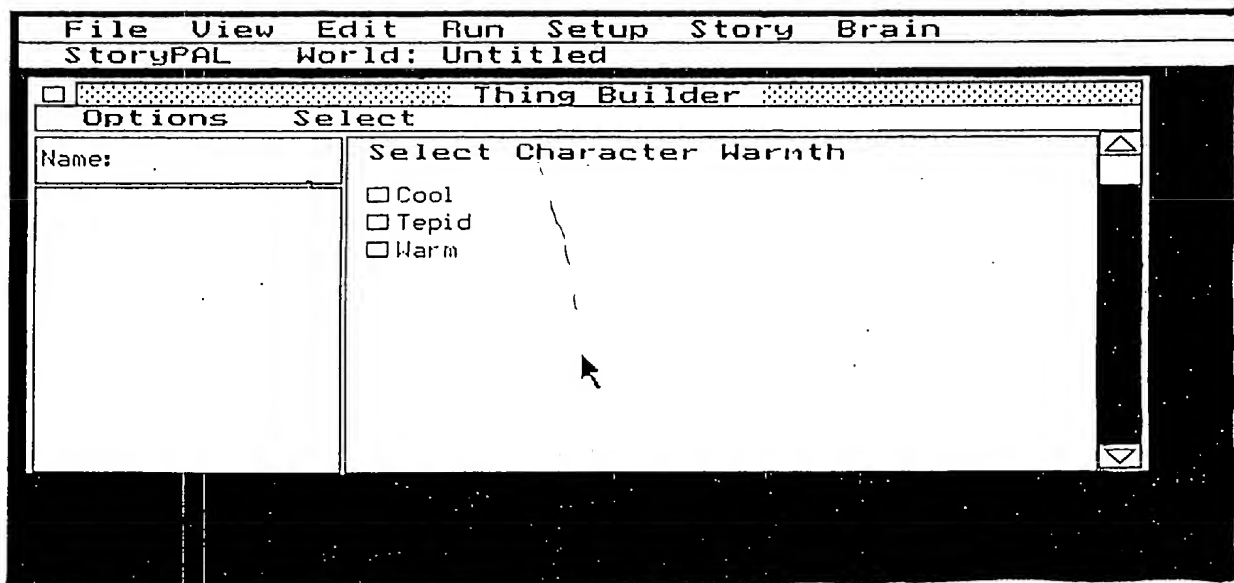


FIG. 21

File View Edit Run Setup Story Brain		
StoryPAL World: Untitled:		
To select behavior, pick up to the stated number from each group:		
<p>Pick one:</p> <p><input type="checkbox"/> Live-animal-like</p> <p><input type="checkbox"/> "-But no metabolism</p> <p><input type="checkbox"/> Live-vegetable-like</p> <p><input type="checkbox"/> Mineral-like</p> <p><input type="checkbox"/> Mixed/other-like</p> <p>Pick zero to 2:</p> <p><input type="checkbox"/> May be eaten</p> <p><input type="checkbox"/> Must eat</p>	<p>Pick no more than one per food chain:</p> <p><input type="checkbox"/> Top 1st food chain</p> <p><input type="checkbox"/> High "</p> <p><input type="checkbox"/> Low "</p> <p><input type="checkbox"/> Bot'm "</p> <p><input type="checkbox"/> Top 2nd food chain</p> <p><input type="checkbox"/> High "</p> <p><input type="checkbox"/> Low "</p> <p><input type="checkbox"/> Bot'm "</p> <p>[Note: StoryPal's type is always Low 1st food chain]</p>	<p>Done</p> <p>Prev</p> <p>Next</p>
		Page: 1

FIG. 22

File View Edit Run Setup Story Brain		
StoryPAL World: AFRICA		
Select other behavior types if your thing matches the headings:		
<p>As a 'bottom' prey:</p> <p><input type="checkbox"/> Stays in one place</p> <p><input type="checkbox"/> Drifts-</p> <p><input type="checkbox"/> Moves by decision</p> <p>As a 'low' animal:</p> <p><input type="checkbox"/> Safe when at home</p> <p><input type="checkbox"/> Safe when near 'top'</p> <p><input type="checkbox"/> Stores food, low</p> <p><input type="checkbox"/> Group/herd behavior</p> <p>[StoryPal-all above]</p>	<p>As a 'high' animal:</p> <p><input checked="" type="checkbox"/> Avoids home of prey</p> <p><input type="checkbox"/> Group/herd behavior</p> <p>[Note: If you make your thing 'low' or 'high' in BOTH food chains, don't pick group/herd behavior]</p> <p>As a Home for thing:</p> <p><input type="checkbox"/> 'Low' - food chain 1</p> <p><input type="checkbox"/> 'Low' - food chain 2</p>	<p>Done</p> <p>Prev</p> <p>Next</p>
		Page: 2

FIG. 23

File View Edit Run Setup Story Brain	
StoryPAL World: Untitled	
Select the other types of behavior your thing has:	
Pick no more than 1 from each group:	
<input type="checkbox"/> Poisonable <input type="checkbox"/> Poison-biter  <input type="checkbox"/> Fetch thrown things <input type="checkbox"/> Throws things <input type="checkbox"/> Fetchable thing  <input type="checkbox"/> Storable food <input type="checkbox"/> Mate eats food store	<input type="checkbox"/> Ambushable <input type="checkbox"/> Ambusher <input type="checkbox"/> 1st Ambushing Place <input type="checkbox"/> 2nd Ambushing Place  <input type="checkbox"/> Impaler-like <input type="checkbox"/> Impaler-killable <input type="checkbox"/> Hurls impalers
<div>Done</div> <div>Prev</div> <div>Next</div>	
Page: 3	

FIG. 24

File View Edit Run Setup Story Brain	
StoryPAL World: AFRICA	
Select your thing's relation to humanoids (StoryPAL), if any:	
Pick no more than 1 from this page:	
<input type="checkbox"/> Place for fire/cook <input type="checkbox"/> Picnic food <input type="checkbox"/> Place for picnic <input type="checkbox"/> Place to store food  <input type="checkbox"/> Obstacle-like  <input type="checkbox"/> Player of 'catch' <input type="checkbox"/> Throwable thing <input type="checkbox"/> Fetches thrown thing	<input type="checkbox"/> gardening tool <input type="checkbox"/> Place to store tools <input type="checkbox"/> place for garden <input type="checkbox"/> seed  <input type="checkbox"/> Home <input type="checkbox"/> Food to store @ home  <input type="checkbox"/> Missile-like  <input type="checkbox"/> Hurlable impaler <input checked="" type="checkbox"/> Impalable-killable
<div>Done</div> <div>Prev</div> <div>Next</div>	
Page: 4	

46/62

FIG. 25

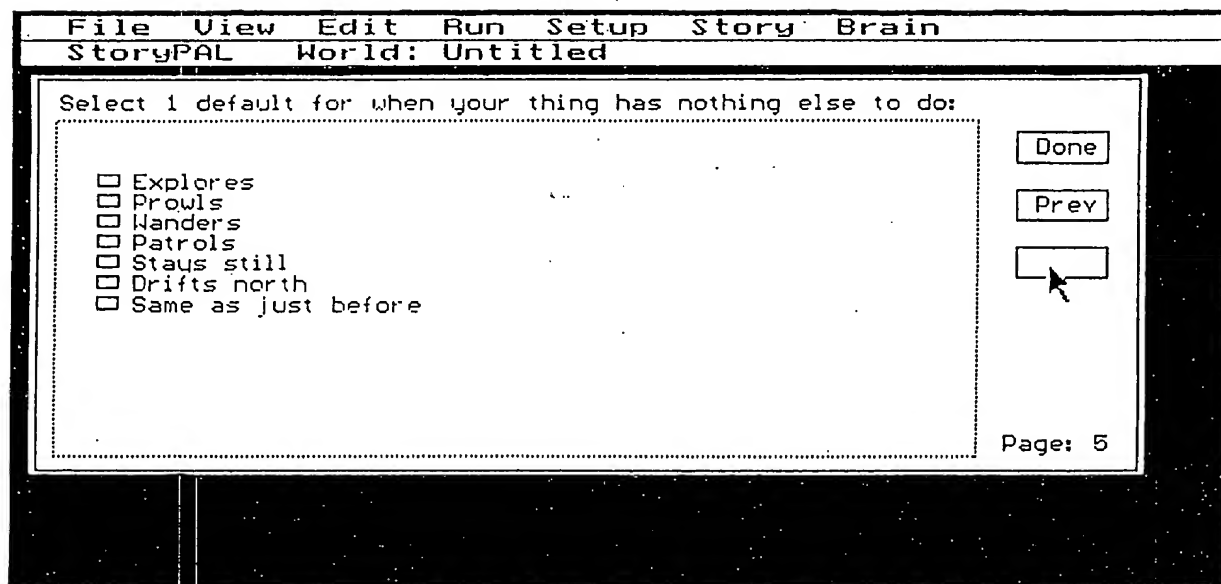


FIG. 26

IQ Setting



47/62

FIG. 27

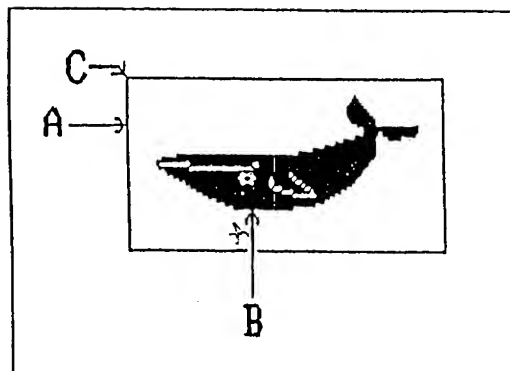


FIG. 28

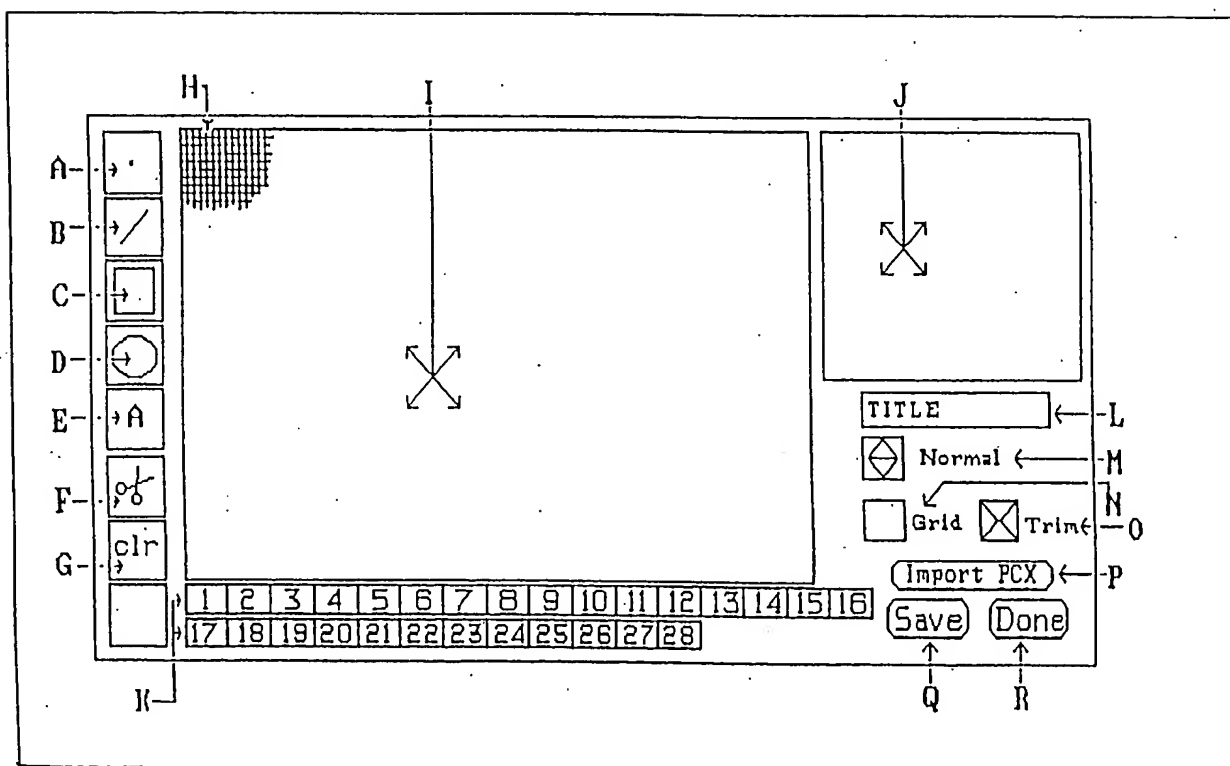


FIG. 29

The Expert System Main Screen Menus

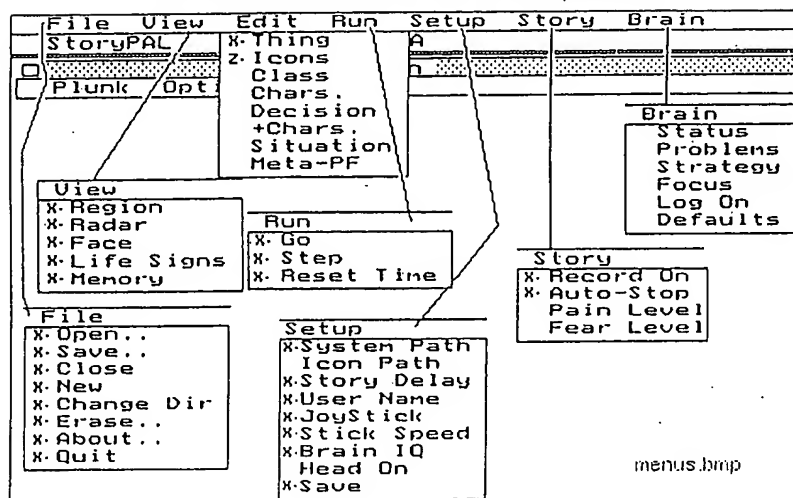
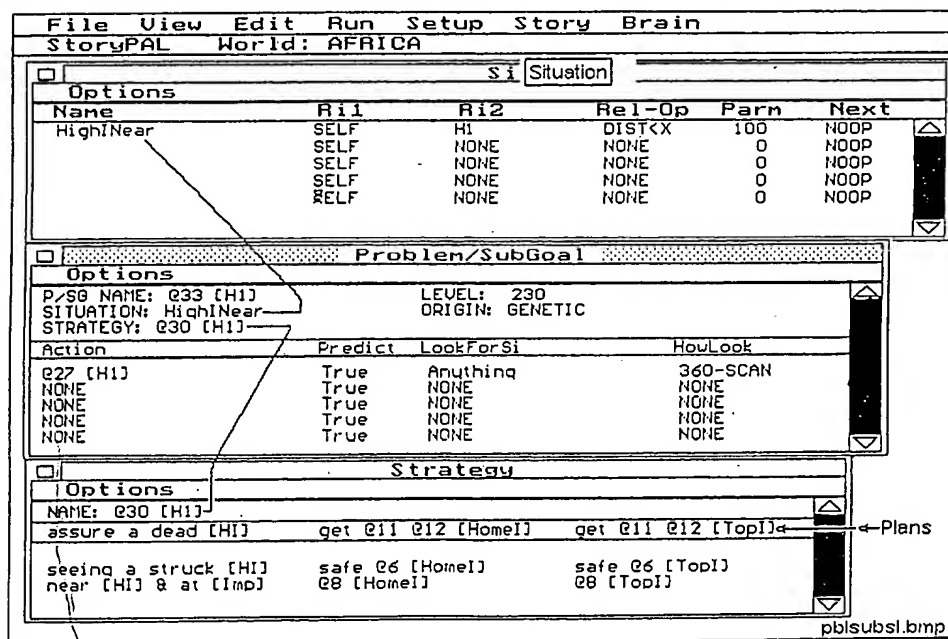


FIG. 31





```
[Get_Next_SX] - FantasyTime False
[Deep Thought] - Ctime: 1
Scanning strategy find something to do rfs:
  No rfs present.
Scanning @14 rfs:
  No rfs present.
```

SxC(1): RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	232	214	NIL	0	1.67	MARV	NIL
lion	243	254	race to LowI	0	2.62	RF-SCAN	LowINear
tree	108	50	don't move	0	6.28	RF-SCAN	Anything
native	269	10	wander	0	1.58	RF-SCAN	Anything
rabbit	2	259	explore	0	4.43	RF-SCAN	Anything
rabbit	257	111	explore	0	5.99	RF-SCAN	Anything
deer	441	314	patrol	0	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	5.26	RF-SCAN	Anything
grass	323	347	don't move	0	0.38	RF-SCAN	Anything
grass	335	86	don't move	0	5.83	RF-SCAN	Anything

```
[What_Now_Porpoise] : FantasyTime False
  Problem: @33 [H1]
    Row: 1
    Dsd: @27 [H1]          180 20 2H1
    Reg: TIRED
    Value: 10
[Set_New_Problem]
[Find_Strategy]
[Find_Starting_Place_In_Strategy] - FantasyTime False
  SUB-P/SG NAME: seeing a struck [HI]
  SUB-P/SG NAME: safe @6 [HomeI]
  SUB-P/SG NAME: safe @6 [TopI]
  SUB-P/SG NAME: near [HI] & at [Imp]
  SUB-P/SG NAME: @8 [HomeI]
  SUB-P/SG NAME: @8 [TopI]
  HIT Strategy
  Strat.:@30 [H1]
    Plan:get @11 @12 [HomeI]
    Row:2
  SubGoal: @8 [HomeI]
    Row: 1

[Strat.Make_Decision]
[Predicting_Strategy] Try: 1 of 25
  Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] - FantasyTime True
```

Ending SxT(1): RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	219	197	@19 @12 [HomeI]	21	2.22	MARV	NIL
lion	236	230	race to LowI	24	1.84	RF-SCAN	LowINear
tree	108	50	don't move	0	6.13	RF-SCAN	Anything
native	268	1	wander	10	4.70	RF-SCAN	Anything
rabbit	11	259	explore	10	6.21	RF-SCAN	Anything
rabbit	264	104	explore	10	0.67	RF-SCAN	Anything
deer	435	292	patrol	22	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	0.67	RF-SCAN	Anything
grass	323	347	don't move	0	1.52	RF-SCAN	Anything
grass	335	86	don't move	0	0.00	RF-SCAN	Anything

```
[What_Now_Porpoise] : FantasyTime True
[Next_N_Subgoals_Reached] - FantasyTime True
  SUB-P/SG NAME: safe @6 [HomeI]
  No next(n) subgoal found.

[Predicting_Strategy] Try: 2 of 25
  Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] : FantasyTime True
```

```
Ending SxT(2):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    206 180  @19 @12 [HomeI]    21    2.22    MARV      NIL
lion        225 208  race to LowI        24    2.05    RF-SCAN   LowINear
tree        108  50   don't move          0    6.13    RF-SCAN   Anything
native      267  10   wander             10    4.70    RF-SCAN   Anything
rabbit      13  268  explore            10    5.01    RF-SCAN   Anything
rabbit      273 104  explore            10    6.27    RF-SCAN   Anything
deer        429 270  patrol             22    1.84    RF-SCAN   Anything
grass       29  326  don't move          0    0.67    RF-SCAN   Anything
grass       323 347  don't move          0    1.52    RF-SCAN   Anything
grass       335  86   don't move          0    0.00    RF-SCAN   Anything
```

```
[What_Now_Porpoise] : FantasyTime True
[Next_N_Subgoals_Reached] - FantasyTime True
SUB-P/SG NAME: safe @6 [HomeI]
No next(n) subgoal found.
```

```
[Predicting Strategy] Try: 3 of 25
Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] - FantasyTime True
```

```
Ending SxT(3):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    193 163  @19 @12 [HomeI]    21    2.22    MARV      NIL
lion        211 188  race to LowI        24    2.17    RF-SCAN   LowINear
tree        108  50   don't move          0    6.13    RF-SCAN   Anything
native      266  19   wander             10    4.70    RF-SCAN   Anything
rabbit      16  258  explore            10    1.20    RF-SCAN   Anything
rabbit      265  96   explore            10    2.36    RF-SCAN   Anything
deer        423 248  patrol             22    1.84    RF-SCAN   Anything
grass       29  326  don't move          0    0.67    RF-SCAN   Anything
grass       323 347  don't move          0    1.52    RF-SCAN   Anything
grass       335  86   don't move          0    0.00    RF-SCAN   Anything
```

```
[What_Now_Porpoise] : FantasyTime True
[Next_N_Subgoals_Reached] - FantasyTime True
SUB-P/SG NAME: safe @6 [HomeI]
```

No next(n) subgoal found.

```
[Predicting Strategy] Try: 4 of 25
Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] - FantasyTime True
```

```
Ending SxT(4):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    180 146  @19 @12 [HomeI]    21    2.22    MARV      NIL
lion        196 168  race to LowI        24    2.19    RF-SCAN   LowINear
tree        108  50   don't move          0    6.13    RF-SCAN   Anything
native      265  28   wander             10    4.70    RF-SCAN   Anything
rabbit      12  248  explore            10    1.96    RF-SCAN   Anything
rabbit      276  85   move from LowI      16    0.75    RF-SCAN   LowINear
deer        417 226  patrol             22    1.84    RF-SCAN   Anything
grass       29  326  don't move          0    0.67    RF-SCAN   Anything
grass       323 347  don't move          0    1.52    RF-SCAN   Anything
grass       335  86   don't move          0    0.00    RF-SCAN   Anything
```

```
[What_Now_Porpoise] : FantasyTime True
[Next_N_Subgoals_Reached] - FantasyTime True
SUB-P/SG NAME: safe @6 [HomeI]
No next(n) subgoal found.
```

```
[Predicting Strategy] Try: 5 of 25
Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] - FantasyTime True
```

```
Ending SxT(5):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    167 129  @19' @12 [HomeI]    21      2.21      MARV        NIL
lion        181 148  race to LowI         24      2.20      RF-SCAN     LowINear
tree        108  50   don't move           0       6.13      RF-SCAN     Anything
native      264  37   wander              10      4.70      RF-SCAN     Anything
rabbit      15  238  explore             10      1.22      RF-SCAN     Anything
rabbit      278  94   explore             10      5.01      RF-SCAN     Anything
deer        411 204  patrol              22      1.84      RF-SCAN     Anything
grass       29  326  don't move           0       0.67      RF-SCAN     Anything
grass       323 347  don't move           0       1.52      RF-SCAN     Anything
grass       335  86   don't move           0       0.00      RF-SCAN     Anything
```

```
[What_Now_Porpoise] : FantasyTime True
[Next_N_Subgoals_Reached] - FantasyTime True
SUB-P/SG NAME: safe @6 [HomeI]
No next(n) subgoal found.
```

```
[Predicting Strategy] Try: 6 of 25
Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] - FantasyTime True
```

```
Ending SxT(6):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    154 112  @19 @12 [HomeI]    21      2.21      MARV        NIL
lion        166 128  race to LowI         24      2.21      RF-SCAN     LowINear
tree        108  50   don't move           0       6.13      RF-SCAN     Anything
native      263  46   wander              10      4.70      RF-SCAN     Anything
rabbit      24  237  explore             10      0.04      RF-SCAN     Anything
rabbit      277 103  explore             10      4.63      RF-SCAN     Anything
deer        405 182  patrol              22      1.84      RF-SCAN     Anything
grass       29  326  don't move           0       0.67      RF-SCAN     Anything
grass       323 347  don't move           0       1.52      RF-SCAN     Anything
grass       335  86   don't move           0       0.00      RF-SCAN     Anything
```

```
[What_Now_Porpoise] : FantasyTime True
Failed worse because of higher problem: the [H1]'s bite-OUCH
Strategy prediction Failed.
```

```
(S) LOST PLAN!
Problem: @33 [H1]
Row: 1
SubGoal: @8 [HomeI]
Row: 1
Dsd: @27 [H1]          180 20 2H1
Reg: TIRED
Value: 10
[Problem.Make_Decision]
```

```
StoryPAL registers:
HURT      0      HUNGER      52      TIRED      12      HURTRATE      0
HUNGERRATE 0      TIREDRATE  0      MOTORRATE  58      FEAR      230
SURPRISE  0      DISAPPOINT 230     FRUSTRATED 128     HOPELESS     0
PAIN/JOY   127     TOTAL      207     0          0          0
```

```
SxX(1):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
lion        236 230  race to LowI         24      1.84      PLUNKED     LowINear
tree        108  50   don't move           0       5.36      PLUNKED     Anything
native      268  1    wander              10      4.70      PLUNKED     Anything
rabbit      671  75   explore             10      5.33      PLUNKED     Anything
rabbit      726 341  explore             10      5.09      PLUNKED     Anything
rabbit      1  254  explore             10      0.47      PLUNKED     Anything
rabbit      261 102  explore             10      1.05      PLUNKED     Anything
deer        435 295  patrol              19      1.84      PLUNKED     Anything
grass       29  326  don't move           0       0.50      PLUNKED     Anything
grass       323 347  don't move           0       2.17      PLUNKED     Anything
grass       758  94   don't move           0       3.37      PLUNKED     Anything
```

```

grass      335  86  don't move      0      4.03  PLUNKED Anything
StoryPAL   226 193  @27 [H1]        21      1.84  MARV      NIL

```

```

[Get_Next_SX] - FantasyTime False
[Deep Thought] - Ctime: 2
Scanning strategy @30 [H1] rfs:
  Warm      HEAT      171    255
  Medium    SIZE      86     170
  Cool      HEAT      1      85
  Mixed hues GREEN    128    255
  Yellow    GREEN     1      127
Scanning @33 [H1] rfs:
  Warm      HEAT      171    255
  Yellow    GREEN     1      127
  Medium    SIZE      86     170

```

```

SxC(2):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    226 193  NIL      21      1.84  MARV      NIL
lion        236 230  race to LowI  24      1.84  RF-SCAN  LowINear
tree        108  50  don't move   0       5.36  RF-SCAN  Anything
native      268  1  wander      10      4.70  RF-SCAN  Anything
rabbit      1  254  explore      10      0.47  RF-SCAN  Anything
rabbit      261 102  move from LowI  10      1.05  RF-SCAN  LowINear
deer        435 295  patrol      19      1.84  RF-SCAN  Anything
grass       29  326  don't move   0       0.50  RF-SCAN  Anything
grass       323 347  don't move   0       2.17  RF-SCAN  Anything
grass       335  86  don't move   0       4.03  RF-SCAN  Anything

```

```

[What_Now_Porpoise] : FantasyTime False
  Problem: @33 [H1]
    Row: 1
    Dsd: @27 [H1]      180 20 2H1
    Reg: TIRED
    Value: 10
[Find_Strategy]
[Find_Starting_Place_In_Strategy] - FantasyTime False
  SUB-P/SG NAME: seeing a struck [HI]
  SUB-P/SG NAME: safe @6 [HomeI]
  SUB-P/SG NAME: safe @6 [TopI]
  SUB-P/SG NAME: near [HI] & at [Imp]
  SUB-P/SG NAME: @8 [HomeI]
  SUB-P/SG NAME: @8 [TopI]
  HIT Strategy
    Strat.: @30 [H1]
    Plan: get @11 @12 [HomeI]
    Row: 2
    SubGoal: @8 [HomeI]
    Row: 1

```

```

[Strat_Make_Decision]
[Predicting_Strategy] Try: 1 of 25
  Trial DSD: @19 @12 [HomeI]
[Get_Next_SX] - FantasyTime True

```

```

Ending SxT(1):
RxName      X      Y      Decision      Speed Rads      Reason      Situation
-----
StoryPAL    212 176  @19 @12 [HomeI]  21      2.26  MARV      NIL
lion        229 206  race to LowI  24      1.83  RF-SCAN  LowINear
tree        108  50  don't move   0       6.13  RF-SCAN  Anything
native      267  10  wander      10      4.70  RF-SCAN  Anything
rabbit      10  257  explore      10      5.96  RF-SCAN  Anything
rabbit      266  87  move from LowI  16      1.20  RF-SCAN  LowINear
deer        429 276  patrol      19      1.84  RF-SCAN  Anything
grass       29  326  don't move   0       0.67  RF-SCAN  Anything
grass       323 347  don't move   0       1.52  RF-SCAN  Anything
grass       335  86  don't move   0       0.00  RF-SCAN  Anything

```

[What\_Now\_Porpoise] : FantasyTime True  
 [Next\_N\_Subgoals\_Reached] - FantasyTime True  
 SUB-P/SG NAME: safe @6 [HomeI]  
 No next(n) subgoal found.

[Predicting Strategy] Try: 2 of 25  
 Trial DSD: @19 @12 [HomeI]  
 [Get\_Next\_SX] - FantasyTime True

Ending SxT(2):

RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	198	159	@19 @12 [HomeI]	21	2.26	MARV	NIL
lion	217	185	race to LowI	24	2.09	RF-SCAN	LowINear
tree	108	50	don't move	0	6.13	RF-SCAN	Anything
native	266	19	wander	10	4.70	RF-SCAN	Anything
rabbit	19	259	explore	10	5.98	RF-SCAN	Anything
rabbit	272	94	explore	10	5.42	RF-SCAN	Anything
deer	423	257	patrol	19	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	0.67	RF-SCAN	Anything
grass	323	347	don't move	0	1.52	RF-SCAN	Anything
grass	335	86	don't move	0	0.00	RF-SCAN	Anything

[What\_Now\_Porpoise] : FantasyTime True  
 [Next\_N\_Subgoals\_Reached] - FantasyTime True  
 SUB-P/SG NAME: safe @6 [HomeI]  
 No next(n) subgoal found.

[Predicting Strategy] Try: 3 of 25  
 Trial DSD: @19 @12 [HomeI]  
 [Get\_Next\_SX] - FantasyTime True

Ending SxT(3):

RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	184	142	@19 @12 [HomeI]	21	2.26	MARV	NIL
lion	202	165	race to LowI	24	2.20	RF-SCAN	LowINear
tree	108	50	don't move	0	6.13	RF-SCAN	Anything
native	265	28	wander	10	4.70	RF-SCAN	Anything
rabbit	27	253	explore	10	0.60	RF-SCAN	Anything
rabbit	284	83	move from LowI	16	0.72	RF-SCAN	LowINear
deer	417	238	patrol	19	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	0.67	RF-SCAN	Anything
grass	323	347	don't move	0	1.52	RF-SCAN	Anything
grass	335	86	don't move	0	0.00	RF-SCAN	Anything

[What\_Now\_Porpoise] : FantasyTime True

[Next\_N\_Subgoals\_Reached] - FantasyTime True  
 SUB-P/SG NAME: safe @6 [HomeI]  
 No next(n) subgoal found.

[Predicting Strategy] Try: 4 of 25  
 Trial DSD: @19 @12 [HomeI]  
 [Get\_Next\_SX] - FantasyTime True

Ending SxT(4):

RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	170	125	@19 @12 [HomeI]	21	2.26	MARV	NIL
lion	187	146	race to LowI	24	2.23	RF-SCAN	LowINear
tree	108	50	don't move	0	6.13	RF-SCAN	Anything
native	264	37	wander	10	4.70	RF-SCAN	Anything
rabbit	32	261	explore	10	5.25	RF-SCAN	Anything
rabbit	274	82	explore	10	3.09	RF-SCAN	Anything
deer	411	219	patrol	19	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	0.67	RF-SCAN	Anything
grass	323	347	don't move	0	1.52	RF-SCAN	Anything
grass	335	86	don't move	0	0.00	RF-SCAN	Anything

[What\_Now\_Porpoise] : FantasyTime True  
 [Next\_N\_Subgoals\_Reached] - FantasyTime True  
 SUB-P/SG NAME: safe @6 [HomeI]  
 No next(n) subgoal found.

[Predicting Strategy] Try: 5 of 25  
 Trial DSD: @19 @12 [HomeI]  
 [Get\_Next\_SX] - FantasyTime True

Ending SxT(5):

RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	156	108	@19 @12 [HomeI]	21	2.26	MARV	NIL
lion	171	127	race to LowI	24	2.25	RF-SCAN	LowINear
tree	108	50	don't move	0	6.13	RF-SCAN	Anything
native	263	46	wander	10	4.70	RF-SCAN	Anything
rabbit	40	255	explore	10	0.62	RF-SCAN	Anything
rabbit	279	73	explore	10	0.98	RF-SCAN	Anything
deer	405	200	patrol	19	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	0.67	RF-SCAN	Anything
grass	323	347	don't move	0	1.52	RF-SCAN	Anything
grass	335	86	don't move	0	0.00	RF-SCAN	Anything

[What\_Now\_Porpoise] : FantasyTime True  
 [Next\_N\_Subgoals\_Reached] - FantasyTime True  
 SUB-P/SG NAME: safe @6 [HomeI]  
 No next(n) subgoal found.

[Predicting Strategy] Try: 6 of 25  
 Trial DSD: @19 @12 [HomeI]  
 [Get\_Next\_SX] - FantasyTime True

Ending SxT(6):

RxName	X	Y	Decision	Speed	Rads	Reason	Situation
StoryPAL	142	91	@19 @12 [HomeI]	21	2.26	MARV	NIL
lion	156	108	race to LowI	24	2.24	RF-SCAN	LowINear
tree	108	50	don't move	0	6.13	RF-SCAN	Anything
native	262	55	wander	10	4.70	RF-SCAN	Anything
rabbit	30	259	explore	10	3.56	RF-SCAN	Anything
rabbit	284	64	explore	10	0.94	RF-SCAN	Anything
deer	399	181	patrol	19	1.84	RF-SCAN	Anything
grass	29	326	don't move	0	0.67	RF-SCAN	Anything
grass	323	347	don't move	0	1.52	RF-SCAN	Anything
grass	335	86	don't move	0	0.00	RF-SCAN	Anything

[What\_Now\_Porpoise] : FantasyTime True  
 [Next\_N\_Subgoals\_Reached] - FantasyTime True  
 SUB-P/SG NAME: safe @6 [HomeI]  
 No next(n) subgoal found.

## FIG. 32

SPACIO-TEMPORAL RELATIONSHIPS r  
IN SOFTWARE EMBODIMENT

Relational Operator	Meaning
NONE	This is the last line. Don't read any further.
DIST>X	The distance between Pi1 (usually the self-object, Ris) and Pi2 is greater than X
DIST<X	The distance between Pi1 and Pi2 is less than X
FASTER	Pi1 is moving faster (more units of distance per Current Situation) than Pi2
SLOWER	Pi1 is moving slower (less units of distance per Current Situation) than Pi2
TOWARD2	Pi1 is moving toward Pi2 ("toward" = Radians in the Parm field. If the angle of movement is less than the Parm field's radians, Toward is True. Zero radians is East or to the Right on the screen)
TOWARD1	Pi2 is moving toward Pi1
AWAYFR2	Pi1 is moving away from Pi2 (parenthetical note on TOWARD2 applies here)
AWAYFR1	Pi2 is moving away from Pi1
>ANGX	The angle between Pi1 and Pi2 exceeds X (X is in radians)
<ANGX	The angle between Pi1 and Pi2 is less than X (X is in radians)
MOVE>X	Pi1 is moving faster than X
<LOCX	Pi1 is at a location whose screen X-coordinate is less than X
>LOCX	Pi1 is at a location whose screen X-coordinate is greater than X
<LOCY	Pi1 is at a location whose screen Y-coordinate is less than Y
>LOCY	Pi1 is at a location whose screen Y-coordinate is greater than Y
1CL2BYX	Pi1 is closer to Pi2 than X units of distance
1FR2CYX	Pi1 is farther from Pi2 than X units of distance
FEEL	The self Pi is feeling as per what is here set out

FIG. 33

56/62

File View Edit Run Setup Story Brain  
StoryPAL World: AFRICA

☐ +Chars.

Char. Name	Situation	Decision	Phantom
2LouSafe@Home2	022 HighIClose@AtHomeII	hide	54
ImpalerHunter	023 AtImpalr&SeeImpalble	throw	39
1LouSafe@ITop	024 HighIClose@AtTopI	copy and do normal	13
storable food	AtIlate	die & renew	48
2LouSafe@2Top	026 HighIClose@AtTopII	copy and do normal	57
Drifter-default	027 AtTopOfScreen	wrap north to south	157
Food to store	028 AtSPDoingEating	die & renew	0
bouncer	AtObstacle	bounce	60

☐ [Situation] S1

Name	R11	R12	Rel-Op	Param	Next
HighIClose@AtHomeII	SELF	HighII	DISTCX	60	AND
	SELF	HomeII	DISTCX	20	NOOP
	SELF	NONE	NONE	0	NOOP
	SELF	NONE	NONE	0	NOOP
	SELF	NONE	NONE	0	NOOP

☐ DsD [Decision]

DsD Name	Angle	Rate	Do	Ri-Name	Register	Value
hide	0	0	7	SELF		0
@19 @12 [CFood]	0	10	0	CFood		0
@19 @12 [Garden]	0	10	23	Garden		0
plant the [Seed]	0	0	19	Garden		0
@19 @12 [Seed]	0	10	0	Seed		0
water the [Seed]	0	0	18	Seed		0
@19 @12 [Shed]	0	10	23	Shed		0
REUSEI	0	0	0	SELF		0

FIG. 34

Do-ings Table

Doing Number	Doing Description	Doing Number	Doing Description
-10	Move the same way as the "Hit" Ri this time or this current situation. Used for "copying" some other Thing, as in flocking behavior.	8	Bitten
-9	Make a buzzing sound	9	Pounce
-8	Make a beeping sound	10	Throw
-7	Make random, or randomize a value.	11	Catch
-6	When Things move off the top of the screen, bring them back to the bottom of the screen.	12	Fly/Swim
-5	Move absolute. A fixed compass setting as opposed to some degrees relative to something.	13	Satiated
-4	Default (On the last page of the Thing Builder is the Thing's Default action)	14	Dead
-3	Be dead	15	Hide/Sit
-2	Move the same as the "Hit" Ri.	16	Light Fire
-1	Do what you did the last move (same direction and rate)	17	Burn
0	Normal (This and the following Do-ings)	18	Douse Fire
1	Chase	19	Reach
2	Flee	20	Door Open
3	Hungry	21	Table Set
4	Hurt	22	Sit & Eat
5	Tired	23	Carry
6	Bite/Eat	24	Cooked
7	Rest	25	Clonked (is there and can interact and be interacted with, but is invisible)
		26	Using a tool



FIG. 35

57/62

File View Edit Run Setup Story Brain							
StoryPAL World: AFRICA							
Options DsD							
DsD Name	Angle	Rate	Do	Ri-Name	Register	Value	
031 [Botm]	0	0	6	HIT	HUNGER	-50	
die	0	0	14	SELF		0	
die & renew	0	0	-3	HIT		0	
wrap north to south	0	10	-6	HIT		0	
move from Low	180	16	2	Low		0	
jump away	180	20	4	HI	HURT	100	
027 [HI]	180	20	2	HI	TIRED	10	

FIG. 36

File View Edit Run Setup Story Brain							
StoryPAL World: AFRICA							
Options MetaPf							
NAME: Low	"	PAGE: 1	ITEM: 21				
Pfs		MetaPf (+)	MetaPf (-)				
food competitor		All - HHT's	High 2 groupies				
1LowNotAmbushable043		Low 1 heal/rest	Non low 1				
1Low-2 084			High 1 groupies				
1Low-3 094			Low 2 groupies				

FIG. 37

File View Edit Run Setup Story Brain			
StoryPAL World: AFRICA			
To select behavior, pick up to the stated number from each group:			
Pick one: <input checked="" type="checkbox"/> Live-animal-like <input type="checkbox"/> "But no metabolism <input type="checkbox"/> Live-vegetable-like <input type="checkbox"/> Mineral-like <input type="checkbox"/> Mixed/other-like  Pick zero to 2: <input type="checkbox"/> May be eaten <input type="checkbox"/> Must eat		Pick no more than one per food chain: <input type="checkbox"/> Top 1st food chain <input type="checkbox"/> High <input type="checkbox"/> Low <input type="checkbox"/> Bot'm <input type="checkbox"/> Top 2nd food chain <input type="checkbox"/> High <input type="checkbox"/> Low <input type="checkbox"/> Bot'm  [Note: StoryPal's tupe is always Low 1st food chain]	
		<div>Done</div> <div>Prev</div> <div>Next</div> <div>Lion</div> <div>← Thing editor, Lion</div>	
Options MetaPf			
NAME: High	"	PAGE: 1	ITEM: 24
Pfs		MetaPf (+)	MetaPf (-)
high 2 →		All - HHT's	High 1 groupies
2HighNearTopII 047			Low 1 groupies
2High-2 088			Low 2 groupies
2High-3 098			Non high 2
bouncer			
Options +Chars.			
+Char. Name	Situation	Decision	Phantom
high 2 →	AtTopII	die & renew	65
Amb/Poi StaysDead019	Dead	die	0
Amb/Poi Dies 020	AtAmbusherOrPoisonBtr	die	0
1LowSafe@Home1 021	HighIClose&AtHome1	hide	10
2LowSafe@Home2 022	HighIClose&AtHome1	hide	54
ImpalerHunter 023	AtImpalr&SeeImpalble	throu	33
1LowSafe@ITop 024	HighIClose&AtTop1	copy and do normal	13
storable food	AtIate	die & renew	48

FIG. 38

58/62

File View Edit Run Setup Story Brain				
StoryPAL World: AFRICA				
Options Chars.				
Char. Name	Register Used	Min	Max	
Small	SIZE	1	85	
Medium	SIZE	86	170	
Large	SIZE	171	255	
Blue	BLUE	1	127	
White	BLUE	128	255	1
Red	RED	1	255	
Yellow	GREEN	1	127	
Mixed hues	GREEN	128	255	
Cool	HEAT	1	85	
Temid	HEAT	86	170	
Harm	HEAT	171	255	
Hungry	HUNGER	106	155	
VeryHungry	HUNGER	156	254	
Starving	HUNGER	255	255	
MaxHunger	HUNGER	254	255	
AnyHunger	HUNGER	70	255	
NotHungry	HUNGER	0	71	
Hurt	HURT	106	155	
Suffer	HURT	156	224	2
AnyHurt	HURT	71	255	
NeedHealin	HURT	125	144	
MaxHurt	HURT	255	255	
Tired	TIRED	106	155	
Sleepy	TIRED	156	224	
NeedRest	TIRED	125	144	
AnyTired	TIRED	71	255	
MaxTired	TIRED	255	255	
LightingFire	DOING	16	16	
UsingGTool	DOING	26	26	
FireOn	DOING	17	17	3
do normal	DOING	0	0	
Reaching	DOING	19	19	
Open	DOING	20	20	
end		0	0	

FIG. 39

File View Edit Run Setup Story Brain				
StoryPAL World: AFRICA				
Options Class Editor				
Name	+Chars.	Chars.		
OnFirePlac	place to make a fire	FireOn		
	NONE	NONE		
	NONE	NONE		
	NONE	NONE		
	NONE	NONE		

FIG. 40

Options Status					
Name	Value	Move	Stopped	Height	FaceMin
HURT	37	-1	-4	0	106
HUNGER	83	2	1	0	106
TIRED	0	2	-4	0	106
HURTRATE	-10	0	0	0	-25
HUNGERRATE	0	0	0	0	-56
TIREDRATE	0	0	0	0	-25
MOTRRATE	13	8	3	-100	11
FEAR	228	0	0	100	90
SURPRISE	0	0	0	40	0
DISAPPOINT	0	0	0	10	0
FRUSTRATED	0	0	0	10	0
HOPELESS	0	0	0	100	0
PAIN/JOY	0	0	0	0	-127
TOTAL	216	0	0	0	0

FIG. 41

59/62

Huh? (lion)

<193,153> to <172,163> Rads: 3.62

Speed: 24

Pf: 2High-3                      098 Si:

LowINear

Dsd: race to LowII Do: 1 Rel.Rx:

deer at <141,179>

Ok

FIG. 42

Enter icon path:

c:\brain

Ok No

Set pain threshold:

20

Ok No

Set fear threshold:

90

Ok No

FIG. 43

Data Structure	Created In Window...	Found In Menu...	Used In Other Data Structure Window(s)...
Pi or Ri (Class)	Class	Edit	Situation & Decision
RF or RI (Char)	Chars.	Edit	Class
PF or PI (+Char)	+Chars.	Edit	Class & MetaPI
Si (Situation-abstracted)	Situation	Edit	+Char, Problem/Subgoal & Strategy
Problem/Subgoal	Problems	Brain	It isn't
Strategy & Plans	Strategy	Brain	Problem/Subgoal
Do-ing	Coded in the program	none	Decision
DsD (Decision)	Decision	Edit	+Char & Problem/Subgoal
MetaPI	Meta-PI	Edit	It isn't
Focus	Focus	Brain	Problem/Subgoal

60/62

## FIG. 44A-1

### STEPS IN A COMPUTER PROGRAM FOR IMPLEMENTING EMOTIONAL EXPRESSION IN AN AUTONOMOUS DECISION SYSTEM

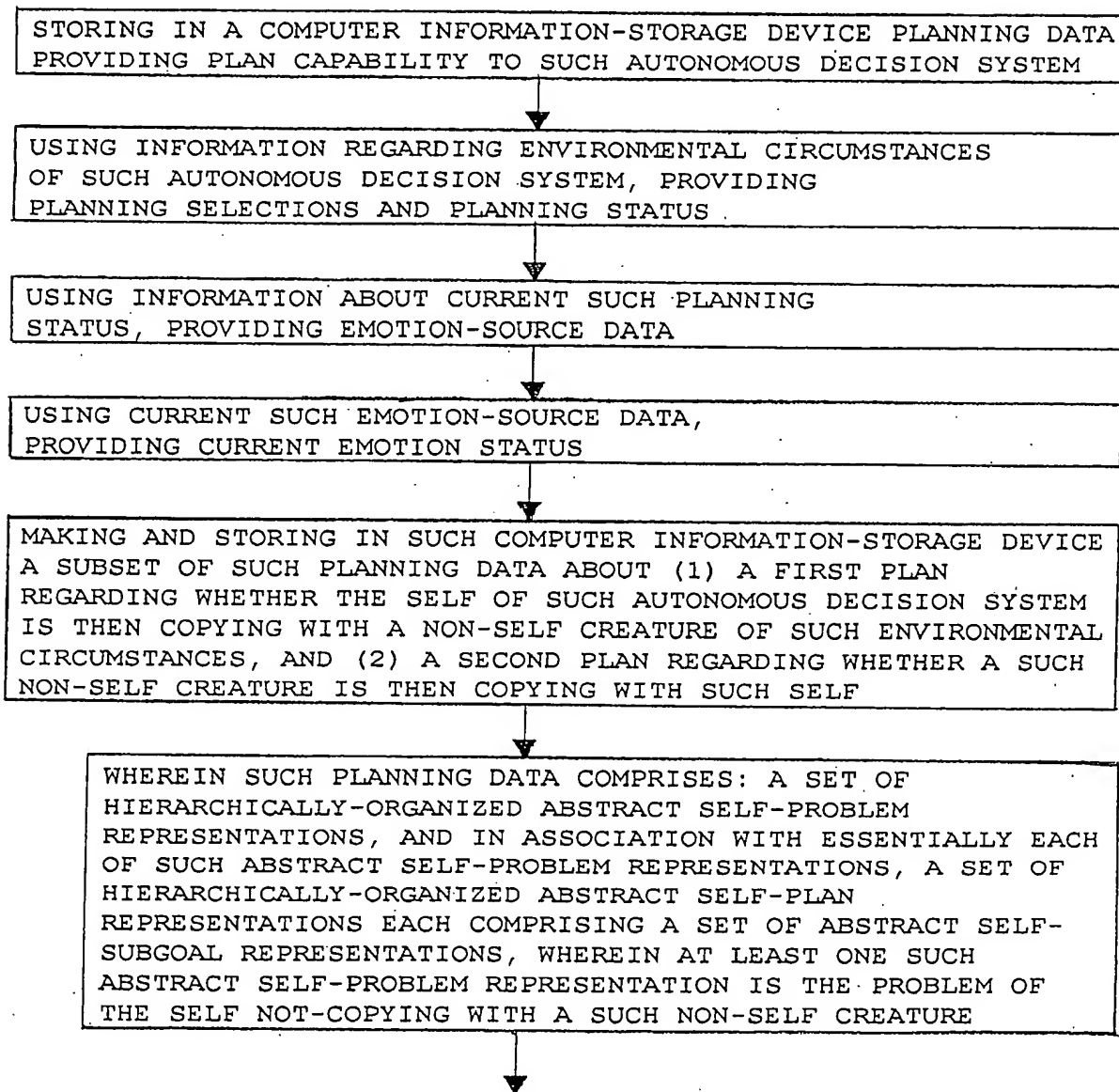


FIG. 44A-2

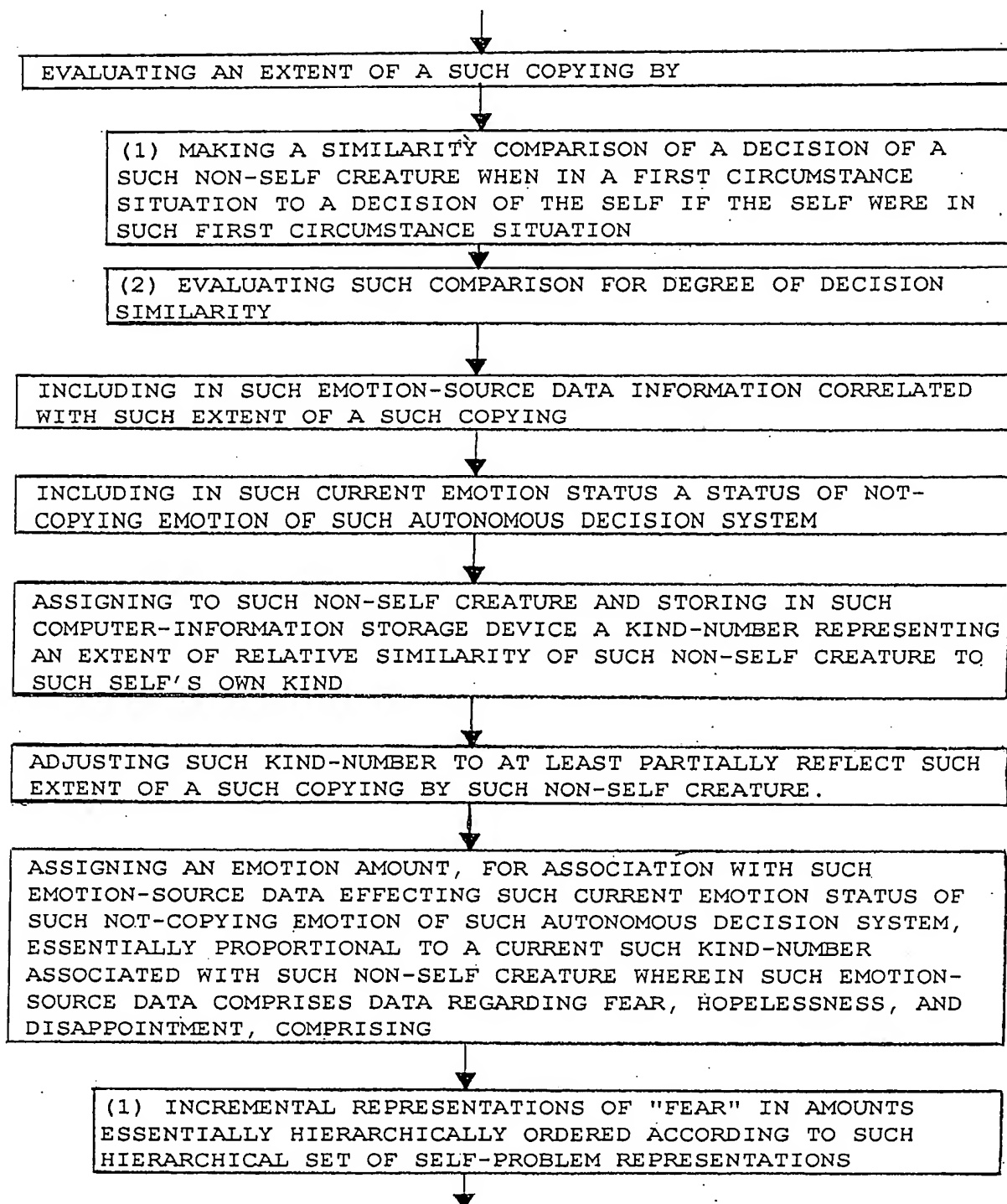


FIG. 44A-3

